VULCAN

SERVICE AND PARTS MANUAL FOR FOOD STEAMERS MODEL: VL SERIES – GAS, ELECTRIC, REGENERATIVE OR DIRECT STEAM

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FORM NO. F-30526A (10-92) (Formerly 990301)

IMPORTANT

OPERATING, INSTALLING AND SERVICE PERSONNEL

Operating information for this equipment has been prepared for use by qualified and/authorized operating personnel.

All installation and service on this equipment is to be performed by qualified, certified, licensed and/ authorized installation or service personnel, with the exception of any part marked with a □ in front of the part number.

Service may be obtained by contacting the Factory Service Department, Factory Representative or Local Service Agency.

DEFINITIONS

QUALIFIED AND/OR AUTHORIZED OPERATING PERSONNEL

Qualified or authorized operating personnel are those who have carefully read the information in this manual and are familiar with the equipment's functions or have had previous experience with the operation of the equipment covered in this manual.

QUALIFIED INSTALLATION PERSONNEL

Qualified installation personnel are individuals, a firm, corporation or company which either in person or through a representative are engaged in, and are responsible for:

1. The installation of gas piping from the outlet side of the gas meter, or the service regulator when the meter is not provided, and the connection and installation of the gas appliance. Qualified installation personnel must be experienced in such work, be familiar with all precautions required, and have complied with all requirements of state or local authorities having jurisdiction. Reference in the United States of America – National Fuel Gas Code ANSI Z223.1 (Latest Edition). In Canada – Canadian Standard CAN/CGA-B149.1 NAT. GAS (Latest Edition) or CAN/CGA-B149.2 PROPANE GAS (Latest Edition).
2. The installation of electrical wiring from the electric meter, main control box or service outlet to the electric appliance. Qualified installation personnel must be experienced in such work, be familiar with all precautions required, and have complied with all requirements of state or local authorities having jurisdiction. Reference: In the United States of America – National Electrical Code ANSI/ NFPA No. 70 (Latest Edition). In Canada – Canadian Electric Code Part 1 CSA-C22.1 (Latest Edition).
3. The installation of steam piping from the source of supply to the service inlet of the appliance. Qualified installation personnel must be experienced in such work, be familiar with all precautions required, and have complied with all requirements of state or local authorities having jurisdiction.

QUALIFIED SERVICE PERSONNEL

Qualified service personnel are those who are familiar with Vulcan equipment who have been endorsed by the Vulcan-Hart Company. All authorized service personnel are required to be equipped with a complete set of service and parts manuals and stock a minimum amount of parts for Vulcan equipment.

IMPORTANT FOR YOUR SAFETY

THIS MANUAL HAS BEEN PREPARED FOR PERSONNEL AUTHORIZED, QUALIFIED, CERTIFIED OR LICENSED TO INSTALL GAS EQUIPMENT, WHO SHOULD PERFORM THE INITIAL FIELD START-UP AND ADJUSTMENTS OF THE EQUIPMENT COVERED BY THIS MANUAL.

POST IN A PROMINENT LOCATION THE INSTRUCTIONS TO BE FOLLOWED IN THE EVENT THE SMELL OF GAS IS DETECTED. THIS INFORMATION CAN BE OBTAINED FROM THE LOCAL GAS SUPPLIER.

IMPORTANT

IN THE EVENT A GAS ODOR IS DETECTED, SHUT DOWN UNITS AT MAIN SHUT-OFF VALVE AND CONTACT THE LOCAL GAS COMPANY OR GAS SUPPLIER FOR SERVICE.

FOR YOUR SAFETY

DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS OR LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.

IN THE EVENT OF A POWER FAILURE, DO NOT ATTEMPT TO OPERATE THIS DEVICE

SERVICE & PARTS MANUAL
FOOD STEAMERS

INDEX

Vulcan steamers are produced with quality workmanship and material. Proper usage and maintenance will result in many years of satisfactory performance.

We suggest that you read this entire manual and carefully follow all of the instructions provided.

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THE ABC'S OF PERIODIC MAINTENANCE

Because of heavy usage, all commercial equipment requires certain periodic maintenance. These instructions are provided to assist the customer and our service agents in maintaining optimum performance and life expectancy from your Vulcan steamer.

ITEM A: Pressure Relief Valve

This protection device will open if the manifold pressure is too high. Replace it if leakage occurs or it opens below its rating of 8 psi.

ITEM B: Load Compensator

(Pre-Vent and Deluxe Automatic Control Models Only)
This thermoswitch controls the preheat cycle. It turns on the red signal light and starts the cooking timer after the compartment has reached 180°F. See "Service Information, Compartment Controls," for calibration instructions.

ITEM C: Steam Solenoid Valve

(Pre-Vent Models Only)
Each VL Pre-Vent compartment has a manual steam inlet and an exhaust solenoid valve. Foreign material can enter the exhaust valve throat, restricting steam flow. Allow the timer to fully complete its 1 minute exhaust cycle (indicated by sounding of buzzer) before turning the control switch to "OFF". This will keep the exhaust solenoid free of foreign material. It can easily be taken apart for cleaning. Refer to "Service Information, Compartment Controls".

ITEM D: Compartment Vent

(Not on Pre-Vent Models)
Exhausts air and condensate from compartment during preheat and cooking cycle. It closes at approximately 180°F. It has a metal-to-metal seat for long life and easy cleaning, and can easily be taken apart.

ITEM E: Pressure Regulating Valve

On models using direct steam supply and models with 15-5 psi controls, this valve is used to control the compartment steam pressure at 5 psi. The hex nut on the bottom is easily removed to clean the strainer and valve seat. Strainer will become clogged if dirty steam lines are connected to direct steam models. This valve is standard on direct steam models and optional on regenerative models.

ITEM F: Low Water Cut-Off/Automatic Fill Controls

ITEM FI: Level Sensing Probes

These controls allow the feed water to enter the generator when the water level is low. They will also shut off the heat source to the boiler if the water level drops too low. The level sensing probes can be easily removed to inspect for lime build-up. As a rule, the condition of these devices will indicate the overall water condition of the boiler. Clean the probes as needed.

CAUTION: Malfunction of controls and serious clogging will occur if a daily blow down of the unit is not performed.

ITEM G: Drain Solenoid Valve

ITEM G1: Drain Solenoid "Y" Strainer

A drain solenoid valve is supplied with the automatic blow down. In order to allow this valve to operate smoothly a "Y" strainer, Item G1, has been inserted upstream. To clean this strainer unscrew the cap on the section protruding downwards. Remove the screen and any foreign particles. Rinse the screen throughly and replace. Replace cap.

ITEM H: Descaler

Hangs submerged in water inside the generator. It helps control scaling. Inspect it every three months. It should be replaced when shrunk to one-half of its original size. Local water conditions generally determine the life of the descaler. The gasket must be replaced at the same time.

ITEM J: Sight Glass Assembly

Indicates the water level inside the generator. Notice the condition of the water in the glass tube. Extreme murkiness indicates that generator should be blown down and/or cleaned. Also indicates bad water conditions. The correct water level is a point approximately ½ the height of the glass. The manual valves at the top and bottom of this assembly must be fully open when operating the generator.

ITEM K: Door Gasket

For maximum gasket life, wash the gasket sealing surface at the end of each day with detergent and rinse with warm water to remove harmful food acids or food particles. Leave the door slightly open when not in use.

ITEM L: Door Handle Screw

Check the threads on the handle screw periodically. Lubricate each month, using only recommended Vulcan graphite lubricant (See Steamer Compartment Door Parts List). Door gasket will not seal tightly if the screw is not lubricated.

ITEM M: Gas Burners

(Not Shown)
Lift out for cleaning. After a period of time, all burners accumulate carbon in their ports and this restricts performance. Use a wire brush to clean the burner ports. Clean as needed, usually about once a year.

THE ABC'S OF PERIODIC MAINTENANCE (Cont.)

ITEM N: Back-Up High Limit Thermostat

This is a protective device to shut off the gas or the electric power if the boiler overheats. Remove the thermostat. Inspect the flat surface of the thermostat for corrosion or rust. Replace if rusted. Clean boiler plate and thermostat surface before remounting or replacing. A good metal-to-metal contact is essential for the proper functioning of the thermostat. This service must be performed at least once a year. On gas boilers the high limit thermostat is located in the face of the boiler close to the level probe casting. For access remove the approximately 2" x 2" metal cover placed over the thermostat. On electric boilers the high limit thermostat is located behind the contactor box cover. Remove the cover. The thermostat is connected to one of the heating element lugs.

ITEM 0: Pressure Switch

This device controls the boiler pressure between prescribed limits by turning the heat source on and off. A back-up limit switch of identical design is provided and has a higher cut-out point than the primary control. These switches must be in adjustment in order to provide proper steam flow to the compartment.

ITEM P: Water Inlet Ball Valve

This valve is the water service valve. It can be used to stop water flow to the unit when the unit is being serviced.

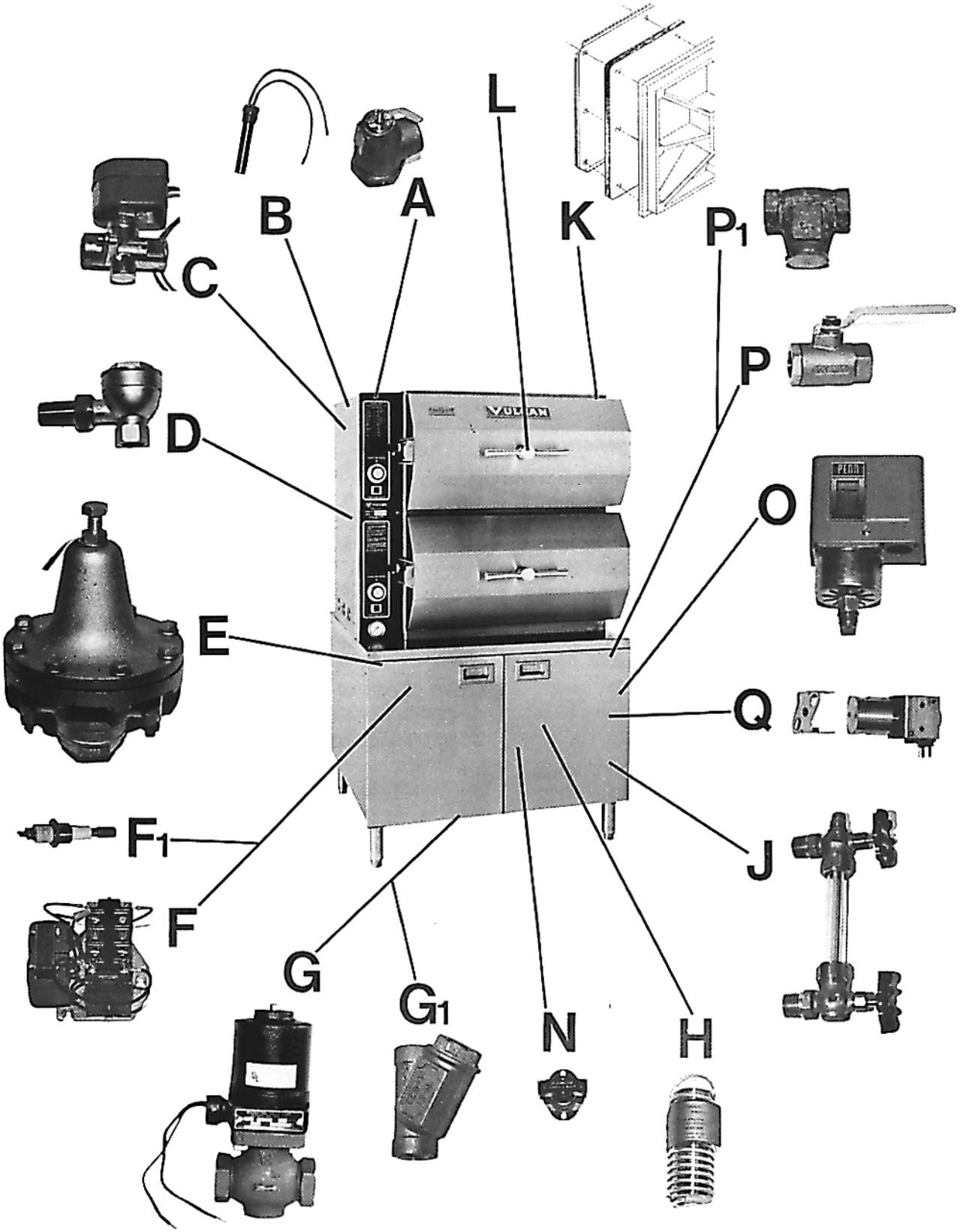
ITEM P1: Strainer

To prevent foreign matter from becoming lodged in the inlet solenoid valve, a strainer is used in the water inlet line.

ITEM Q: Generator Fill Solenoid Valve

This valve admits water to the boiler when demanded by the automatic fill controls (Item F and F1) in order to maintain the correct water level in the steam generator. The valve can easily be taken apart for inspection and cleaning. Refer to "Service Information, Steam Generators".

THE ABC'S OF PERIODIC MAINTENANCE (Cont.)



SERVICE INFORMATION: Steam Generators

WARNING: BEFORE PERFORMING ANY SERVICE ON THIS UNIT, DISCONNECT ELECTRICAL POWER SUPPLY AND PLACE A TAG AT THE DISCONNECT SWITCH TO INDICATE THAT YOU ARE WORKING ON THE CIRCUIT. TURN WATER SUPPLY OFF, RELIEVE LINES OF PRESSURE, AND ALLOW UNIT TO COOL. WHEN WORKING ON GAS UNITS, TURN OFF GAS SUPPLY.

GENERAL: It is recommended that steam generators be thoroughly inspected at least on three month intervals, and more frequently in hard water areas and/or for units heavily used. This inspection consists of an internal examination and cleaning of the generator shell, an examination and possible replacement of the descaler, a check of lime build-up on the level sensing probes, and a check of all generator controls including the pressure switches.

1. To inspect and clean the inside of the generator shell:

Follow the procedure shown in the Operating Manual for flushing (blowdown) the steam generator. Drain water from the shell with the electric power "OFF" (No heat "ON"). Hold the pressure relief valve open to allow air to enter for better drainage. Remove the generator hand hole cover (top front of shell) by removing the nut and clamp, then tapping the cover lightly to free it, while holding the cover stud (this prevents the cover from dropping into the generator). When replacing the cover, the gasket seating surfaces must be clean. Always use a new cover gasket.

Use wire brushes to free the scale. Loose material must be either scooped from the steam generator or flushed through the drain.

A suitable agent for removing lime may be used to remove the scale build-up, but great caution must be taken to avoid damage to brass and copper parts of the generator controls, etc.

If solvent is to be used, it is recommended the generator, (see instructions for removing the generator) the descaler, sensing probes, and the heating elements or steam coils, if furnished, be removed; the shell be stood on end, and filled with solvent. One commonly used agent is muriatic (hydrochloric) acid. Two parts of commercial muriatic acid to 14 parts cold water should be strong enough. A soaking period of several hours may be required on a heavily scaled shell. Then drain completely and thoroughly flush the shell with fresh water, repeating several times to be sure all traces of the lime removing agent are flushed away.

CAUTION: Acid is very harmful to the eyes, skin, clothes, and some wall, floor and drain piping materials; therefore, it must be handled with extreme caution. Follow the instructions provided on the product's container. Be sure work is performed in a well ventilated area.

2. To check or replace the descaler:

The descaler is accessible through the hand hole opening. It is a coiled wire wound around a solid cylindrical core, and hangs by an open loop from the shell's horizontal stay rod, about 4" from the front of the shell. If the wire is eaten through, or if the core of the descaler is eaten away to half its original size, a new descaler should be installed. To install, stretch its wire coil so the descaler hangs with its core completely below the minimum water level in the generator, but hanging free. The descaler must not contact the bottom of the generator shell, or the heating elements or steam coils, if furnished.

3. To check or service the low water cut-off/automatic fill control:

Steam generators are equipped with level sensing probes and relays for controlling the flow of feed water to the boiler and to turn off the heat source when the level is too low.

The low level control is a simple series circuit composed of a transformer, secondary coil, relay coil, electrode, metal boiler, and water. When the water is below the low level cut-off electrode probe, the circuit is open and the coil is de-energized. When the water level is at or above the electrode probe, the circuit is closed by a path through the liquid from the probe to the metal boiler. The relay coil and the NO relay contacts 7 & 8 transfer position activating the heating contactor, or combination control, or solenoid valve.

The differential level control relay coil energizes and the NC contacts 3 & 4 transfer positions, once the elevation of the water reaches the top probe.

The relay coil will de-energize when the water level recedes below the low level probe. This is achieved by holding the circuit closed with the use of an additional lower electrode probe through the NO contacts 7 & 8 on the relay. The relay energizes when the water level reaches the top high level electrode probe, but does not de-energize until the level recedes below the low level electrode probe.

Loose electrical connections may prevent the heat from coming on or may cause the boiler to overfill. Accumulation of boiler scale on or near the sensing probes may cause them to retain water on the insulator surface. This may prevent the boiler from filling or cause dry firing. **Dry firing will result in damage to the boiler shell and to the electric heating elements, if furnished.**

Check the probes and contactors in the following manner with the probe wire removed:

Check the probe at wire connection and shell with an ohmmeter. There should be no resistance present when the boiler is empty. If resistance is present remove and clean the probes, and check them for a cracked insulator. Reinstall and check their operation.

You should read continuity between the probes and shell only when the boiler is full of water.

Low level and differential contactors should be checked as follows:

With a voltmeter, check across terminals 1 & 2. The meter should read 115 volts. Across terminals 9 & 10 you should read 350 volts. Using a jumper wire, jump terminals 9 & 10. The contactor should engage. If it does not, replace the contactor.

To remove a sensing probe, first remove the bolted cover over the sensor cluster. Then remove the wire from the probe and unscrew the probe using a wrench. Be careful to note the location of each probe and the number of the wire connected to it. Incorrectly connected wires will cause the controls to malfunction. Clean the probe thoroughly paying particular attention to remove all deposits from the insulator. Use no abrasive on the insulator. A soft cloth should do the cleaning.

4. To clean or replace a water level gauge glass:

Close the valve at the top and bottom of the gauge assembly. Unscrew the packing nuts at the top and bottom of the glass tube. Slide the glass tube up until the bottom of the tube is clear of the fitting. When reinstalling the tube, use new sealing washers. Do not overtighten the packing nuts because it could break the gauge glass. Check that both top and bottom valves are fully open.

5. To adjust or check pressure switches:

There are two pressure switches located inside the boiler control box. One pressure switch is cycling or primary control, and the other is the high-limit control. They are identical units, except for their settings. Each switch is identified by a label attached to the switch case, and the labels show the proper settings. There are two square head slotted adjustment screws which project through the top of the switch case and a dial with pointers to indicate the setting. The adjustment screw directly above the dial changes both the cut-out and the cut-in points. Set the cut-out point first. Turning the screw clockwise increases the pressure. Next set the cut-in point using the other adjustment screw. Remove the switch cover to check the wiring. If the wiring is correct, and an adjustment of the settings does not correct the problem, replace the control. Do not attempt to disassemble the switch or its operating mechanism.

6. To replace high limit thermostat:

On gas boilers, the thermostat is mounted to the boiler front plate by two weldstuds. Remove the thermostat cover box for access, and then remove the two nuts which secure the thermostat. On electric boilers, the thermostat is connected to one of the lugs on the electric heating elements.

7. To remove the generator assembly:

Drain the generator. Remove any control boxes which would obstruct the removal of the boiler from the front of the generator base. Disconnect all service lines to the generator, and disconnect the boiler drain line and steam supply line. Remove all the screws holding the flue and flue collector to the generator. Remove the anchor screws holding the generator to the frame. Slide the generator forward. The burner box, anchored only by the generator, must be prevented from sliding forward with the generator.

8. To service the steam generator fill valve, and boiler- drain, cold water condenser valve:

It is not necessary to remove the valve body from the supply line to disassemble the unit. Remove the retaining cap and remove the coil assembly. Unscrew the stem from the valve body. All parts are now accessible for inspection and cleaning. Do not reuse damaged or worn parts. Pay careful attention to proper orientation and placement of parts during assembly.

9. Steam generator operation and service:

GAS GENERATORS

A gas pressure regulating valve is an integral part of the gas control valve and is set for 3½" W.C. for natural gas, and 10" W.C. for propane gas. Limited adjustment is provided by a screw under a cap on top of the valve body. Turn the screw clockwise to increase the gas pressure to the main burner.

The pilot burner flame is controlled by an adjustable valve located under a cap behind the dial of the valve. Turn it clockwise to decrease the pilot flame. The pilot flame should be a steady blue flame which surrounds the thermocouple tip, and it should be about 1" long. A pilot orifice fitting is located at the bottom of the pilot and is the hexagon fitting to which the gas supply tubing to the pilot is attached.

a) Servicing the pilot, thermocouple & main burners:

To remove the pilot assembly, disconnect the thermocouple and the pilot gas supply tubing from the combination control valve, and remove the two screws holding the pilot to its bracket.

To remove a main burner, lift the burner and move it to the rear to clear the orifice hood. Then bring it forward around the manifold pipe.

When experiencing nuisance pilot outages, visually check for a proper pilot flame. Also see if unusually strong drafts might be interfering with the proper heating of the thermocouple by the pilot flame. Adjust the height of the pilot flame if necessary. If adjustment does not result in a pilot flame of proper size then something is obstructing the gas flow. The trouble may be a plugged pilot orifice, a kinked or plugged pilot gas supply tube, or the low pilot flame could be caused by a malfunction in the combination control valve, or by low or high gas supply pressure. The pilot operates at gas supply pressure. The pressure regulator in the combination valve regulates only the pressure of the gas to the main burner.

If the pilot flame is correct and there are no drafts, then the trouble is in the thermocouple or the combination valve. Check the thermocouple with a milli-voltmeter. If a meter is not available, replace the thermocouple with a new one as a check. The connection of the tubing from the thermocouple tip to the control valve is an electrical connection and must be clean. Do not use any sealing compound on the threads. Tighten the nut finger tight plus ¼ turn. Do not overtighten this nut. To check a thermocouple with a milli-voltmeter, make a closed circuit check (an adapter is required). Closed circuit reading should be 13 to 26 MV. Next, blow out the pilot flame. The reading when the protection closes should be at least 5 MV below the first reading. If the first reading is correct, but the drop out point is not, the trouble is in the combination valve. An open circuit check of the thermocouple should give a meter reading of 30 to 40 MV.

b) To replace the combination control valve:

NOTE: Disassembling this control is not recommended. If the control is not working, replace the entire control.

To remove the valve, first disconnect the wires and conduit running to it. Disconnect the thermocouple lead and the pilot gas supply tube from the control, and uncouple the pipe unions on each side of the control.

ELECTRIC GENERATORS:

a) To service or replace the magnetic contactor:

The contactor can be serviced by removing the cover of the contactor box. A noisy contactor (hum or chatter) is generally due to enough dust or dirt on the armature pole faces or around the armature core, that the magnet coil cannot pull the armature into a completely sealed position. This can usually be corrected by blowing or wiping the pole faces clean. To inspect contactor points, remove the cover at the top of the contactor by removing the two screws which hold it in place. Contactors should be replaced if points are pitted or burned.

b) To check or replace an electric element:

A check with an ammeter with power "ON" to the elements is the best way to determine whether all elements are heating properly. See appropriate wiring diagrams (pages 21-23) for amperage ratings.

IMPORTANT: Always ensure the supply voltage and the voltage rating of the element agree.

To replace an element, drain the water from the generator shell. Remove the cover of the contactor box, remove the electric wires to that element's terminals, remove the bolts through the flange of the element and pull the element forward. When replacing an element, always use a new gasket. The flange and tube surfaces which contact the gasket must be clean. If the removed element shows a pronounced scale build-up on its heating tubes, the other elements should be removed and mechanically cleaned to remove the scale. This will prolong their life. Do not immerse the element in a chemical solution to descale.

C. SERVICE INFORMATION: Steam Generators (Cont.)

c) For inoperative control circuit (generator control and compartment controls):

If the steamer is equipped with a step down transformer, check for proper operation. If there is a separate 120 volt line for control circuits, check this line for power.

STEAM COIL GENERATORS (REGENERATIVE):

The steam coils are intended for use at a steam supply pressure of 15 psi maximum. A pressure regulating valve is available as optional equipment for units where the steam supply pressure exceeds 15 psi. Regulators of a different make and type may be supplied at different times and to meet special conditions, therefore no specific service information is included here. The regulator used will be of the adjustable type and should be set for a discharge pressure of 15 psi. A pressure gauge is provided to indicate the regulator discharge pressure. The regulator should be set when steam is flowing (steam solenoid valve is open). If steam is heavy with condensate, the installation of a ball float trap in the steam line before the pressure regulating valve is recommended.

To remove a steam coil:

Disconnect the union in the steam supply line to the coils and in the condensate discharge line from the coils. Remove the header that supplies steam to the coils by disconnecting the union at each coil. In the same way, remove the coil condensate collection header. Remove the four bolts clamping each coil flange in place and pull the coil forward. Use a new flange gasket when replacing the coil. The faces that mate with the gasket must be clean.

SERVICE INFORMATION: Compartment Controls

Procedure for access to compartment controls:

1. Remove the two screws located above the compartment control panel, and remove the control panel hold down strip.
2. Pull the timer control knob forward as well as the pressure gauge face plate.
3. Remove the nameplate carefully. Pull the nameplate out approximately 3/4" along its right edge (the edge near steamer doors) so fingers can slide behind the nameplate along the edge. Now slowly pull the nameplate forward and to the right in order to remove its left edge from under lip.
4. Loosen the nuts holding the control panel. The nuts can be reached by placing a wrench through the slots located along the right edge of the panel (adjacent to the steamer compartment).
5. Pull the control panel forward.

Check for failure of the Control Circuit in the following order:

Step 1: Check to see if electric power is reaching the control circuit through the compartment switch when it is turned "ON".

Step 2: On electric heat models with a transformer, check the step down transformer (located inside the contactor box) for proper operation.

Step 3: Check that the timer switches are functioning as shown on the wiring diagram.

Step 4: Check that the timer motor operates when connected to power.

NOTE: If trouble is found in the timer, replace it. We do not recommend taking the timer apart.

Step 5: Check the wiring for damaged insulation (no short circuit).

Step 6: Check for loose connections (no open circuit).

Step 7: Check that all connections are made according to the compartment control wiring diagram (if the controls had been operating properly prior to the trouble, it is safe to assume that the wiring connections are correctly made).

Load Compensator Adjustment:

(Pre-Vent and Deluxe Automatic Control Models Only)

One possible cause of trouble is the load compensator switch. It is a thermostatic switch with a stainless steel housing. It screws into a 1/2" fitting welded to the left side wall of the compartment. This switch should close when the compartment temperature reaches 180°F. The switch can be adjusted by turning the slotted screw. Turn the screw clockwise to reduce the closing temperature.

The correct adjustment of the load compensator can best be made by using a remote reading temperature indicator which uses a thermocouple to sense the temperature. Locate the thermocouple near the exposed bulb of the load compensator inside the compartment. Close and seal the compartment. Then pull the steam valve handle out, turn the compartment switch on, and set the timer. Monitor the thermocouple temperature, and adjust the load compensator so the red light of the compartment switch lights when the thermocouple reads 180°F. If the

timer stops, the red light is out, and the buzzer does not sound after the compartment has exhausted, then the load compensator is set too high.

A similar situation exists if the cooking cycle is started normally, but the red light and timer do not come on, or an abnormal amount of time elapses before they come on, or the time is set according to past practice for the product, and the product is overcooked. If there is too short a time between starting and the red light coming on, or if it comes on immediately, the load compensator is set too low.

Service to Steam Inlet and Exhaust Valves:

All models have a mechanical inlet and mechanical outlet valve, except the Pre-Vent model, which has a mechanical inlet valve and a solenoid outlet valve.

The magnetic coil of a solenoid valve is removed from the valve by removing the snap catch at the center top of the coil housing, and then lifting the coil and its housing off. Unions are provided to allow easy removal of the valve bodies. The solenoid valves must be removed to disassemble them. Remove the two screws and then remove the inlet part of the body, the compression spring on the back of it, and the exposed plastic part.

Unscrew and remove the plunger tube. Remove the plunger and valve blade, which is pinned to the plunger. The plastic seat on the exhaust side of the valve blade may now be removed from the body. Note that this is a direct acting valve. The blade must be clean. The blade mating surfaces of the plastic seat members, especially the one on the exhaust side, must be flat and undamaged. The plunger and plunger tube must be clean, and the plunger must be able to freely slide in the tube. The compression spring which fits in the hole in the top of the plunger must be clean and free.

IMPORTANT: The blade on the exhaust valve must be installed with the small end of the tapered hole facing toward the inlet end of the valve.

The mechanical valve stems may be packed by removing the operating lever from the stem. Use string packing suitable for steam service. For any other service to these valves, remove the stem assembly and cap at the top of the valve. Check the valve linkage for loose or binding parts.

CAUTION: Do not overtighten packing glands, the linkage system must be free enough for the spring to return the system to the fully closed position.

NOTE: In the event of an electrical component or a power failure, the steam control arm can be operated manually on automatic models.

The valve linkage for the manual or automatic controls is simple and its function easily seen. The inlet and exhaust valve must be positioned so the inlet valve is open and the exhaust valve closed when the steam control lever is pulled forward, and the inlet valve fully closes when the control lever is released.

TROUBLESHOOTING: Steam Generators

PROBLEM	CAUSE	SOLUTION
1. Generator won't heat.	No electric power to controls.	Check connection to power source.
	No energy source.	Check gas, or steam supply or electric supply.
	Pressure switch not working.	Check set points.
		Replace switch.
	Water level too low.	Water inlet valve closed.
		Feed-water solenoid valve closed.
	Water level control system malfunctioning.	Check operation.
	Pilot light out. (Gas generator only)	Check for drafts.
		Malfunction in combination valve.
		Interruption of gas supply.
	Wiring problem.	Short circuit.
		Worn insulation.
		Loose connection.
		Improper wiring.
	Malfunctioning Combination Control Valve. (Gas models only)	Replace valve.
	Pressure regulating valve defective or misadjusted.	Clean strainer.
		Adjust valve setting.
	Defective contactor. (Electric models only)	Clean armature face.
		Replace contactor.
	Heating elements burned out. (Electric models only)	Replace element.
2. Generator water level too high.	Water fill solenoid not closing properly.	Clean valve.
		Replace valve.
	Water level control system malfunctioning.	Check system.
3. Generator pressure too high.	Pressure switch not functioning properly.	Adjust switch.
		Replace Switch
	Cycling switch set too high and operating on high limit switch.	Adjusting cycling switch
4. Steam output low.	Electric model.	Burned out element(s).
		Bad contactor(s).
		Scale build-up on elements.
	Regenerative model.	Check for dry steam.
		Check steam flow rate and pressure.
		Scale build-up on steam coils.
	Gas model.	See item 1 above.
	Direct steam model.	Partially clogged steam line.
		Incoming line too small.

TROUBLESHOOTING: Doors and Compartments

PROBLEM	CAUSE	SOLUTION
1. Latch paddle does not catch automatically as the door is shut.	Broken tension spring.	If it is an automatic model, first turn off the electricity to the unit. Remove the upper left side panel and replace the catch spring.
2. Door screw hard to turn.	Foreign matter or lack of lubricant causing threads to bind.	Remove the screw, clean the threads (both screw and bushing) and lubricate. Use a high temperature grease. A high temperature grease is listed in the repair parts list.
	Door screw bent, or threads badly worn.	Replace the door screw and handle assembly. Check the bushing and replace it if there is evidence of wear.
3. Door screw too loose in bushing.	Wear of screw or bushing or both, or bushing screws loose, giving a false indication of wear.	Replace worn parts. To remove the bushing, remove the door arm cover panel and/or the floating cast door and the pressure bar. (Refer to exploded view on page 25.)
4. Condensed Steam (water) accumulates in compartment and will not drain out as it should.	Stopped up exhaust system, or malfunction of exhaust system or its control.	Locate and remove obstruction and/or determine cause of and correct malfunction of the exhaust system. Access to system is by removing upper left side panel.
	Cabinet not level.	Level cabinet so as to drain water. See installation instructions.
5. Steam is "OFF" (as at end of a cooking cycle) But compartment is still under pressure, or steam is still entering compartment.	Malfunction of exhaust system and/or steam supply valves.	Correct malfunction of exhaust system (See Item 4 above) and/or malfunction of steam supply valves.
6. Steam enters compartment and continues to escape from compartment through automatic air vent (trap) or through the compartment exhaust valve.	Automatic air vent (trap) not working (There is no air vent on Pre-Vent models).	Check valve and thermostatic operator of trap to determine why they are not working and correct the fault. Access to trap is by removing upper left side panel.
	Compartment exhaust valve not closing properly (Note: Pre-Vent models have a small port in the exhaust valve which bleeds off air and condensate at a limited rate during the cooking cycle.)	Check the compartment exhaust valve to determine why it is not working and correct its failure to close properly. Access is by removing upper left panel.
	NOTE: When steam is first turned into compartment, the displaced air escaping from the compartment through the trap makes a hissing noise. This noise should stop when the thermostatic operator of the trap reacts to the heat from the steam reaching it and then closes.	

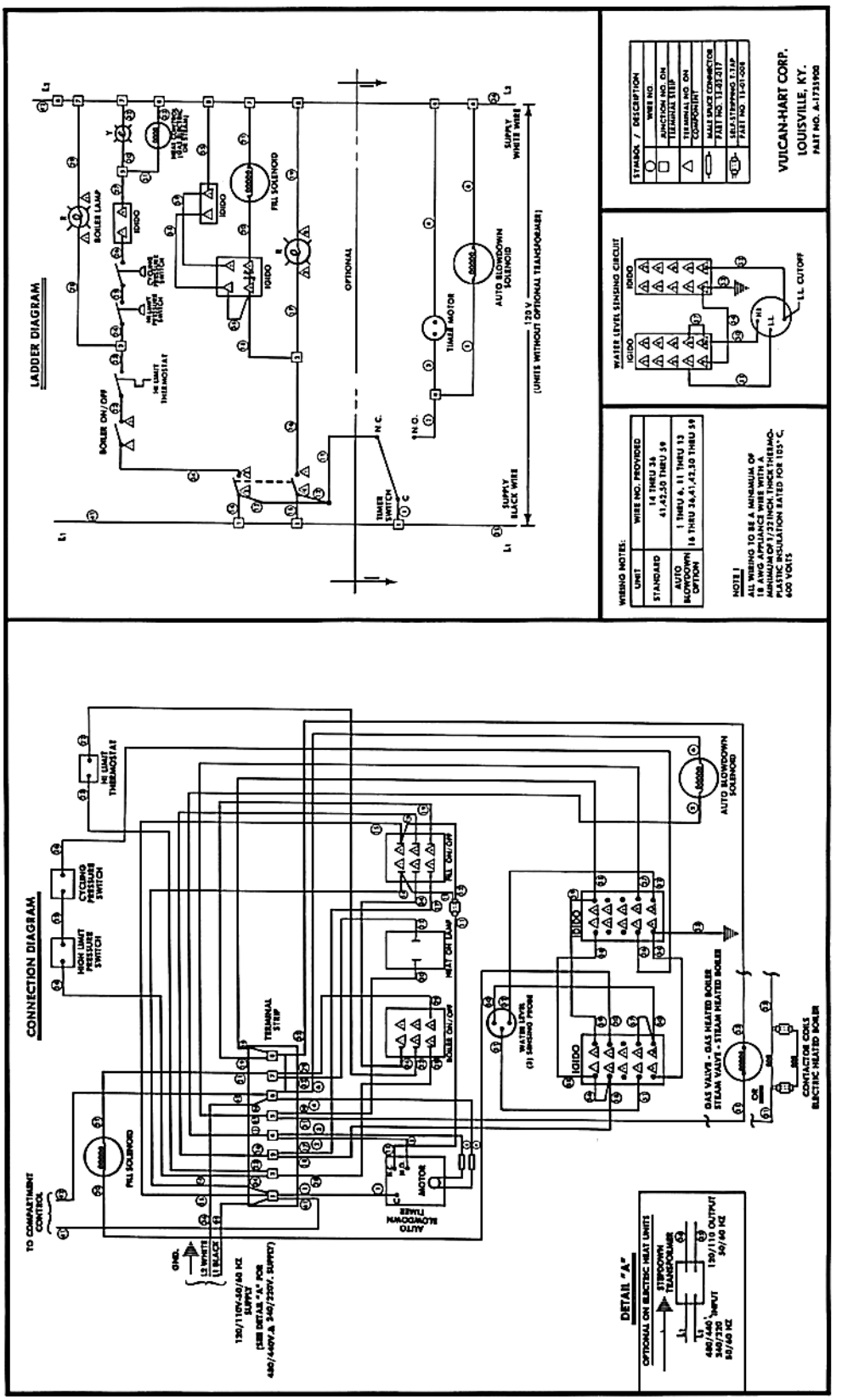
TROUBLESHOOTING: Doors and Compartments (Cont.)

PROBLEM	CAUSE	SOLUTION
7. Compartment door is closed and steam should flow to compartment but does not.	No steam available in supply line or steam pressure too low under flow conditions.	*If unit is direct steam connect type,* check the building steam supply line and steamer pressure regulating valve setting (located in the steam line below the lower compartment). To change the pressure regulating valve setting, turn the stem in bonnet of valve clockwise to increase discharge pressure. *If unit is self-generating type, check steam generator and its controls.* **NOTE:** The pressure in the supply lines (the pressure gauge indicates this pressure) when the compartment is at cooking temperature (low steam flow) should be 4 1/2 to 5 1/2 p.s.i. When the steam is first turned on to the compartment, high steam flow rates will cause this pressure to drop. In checking, consider the possibility of a defective pressure gauge. Check and correct. Access is by removing upper left side panel.
	Steam supply valve not properly opened or supply line plugged.	Check and correct. Access is by removing upper left side panel.
	Automatic air vent (thermostatic trap) or exhaust valve is closed so that compartment is air bound.	Check and correct. (Replacement of the thermostatic trap would probably be indicated). On Pre-Vent models, clean the port on the exhaust solenoid valve.
8. Pressure relief valve leaks steam or opens frequently.	Defective relief valve.	Replace relief valve.
	Pressure in supply line is too high.	Correct. (See Item 7 above).
	Manual trip mechanism is caught or bound and holds the valve open.	Correct condition.
	Dirt under valve disc.	With 3 to 6 p.s.i. pressure in the steam supply header, manually trip the relief valve, opening as wide as possible, and hold it open for a few seconds in an effort to blow the dirt away. **NEVER** attempt to correct trouble with the relief valve by disassembling the valve. Replace the relief valve if the above does not cure the trouble.

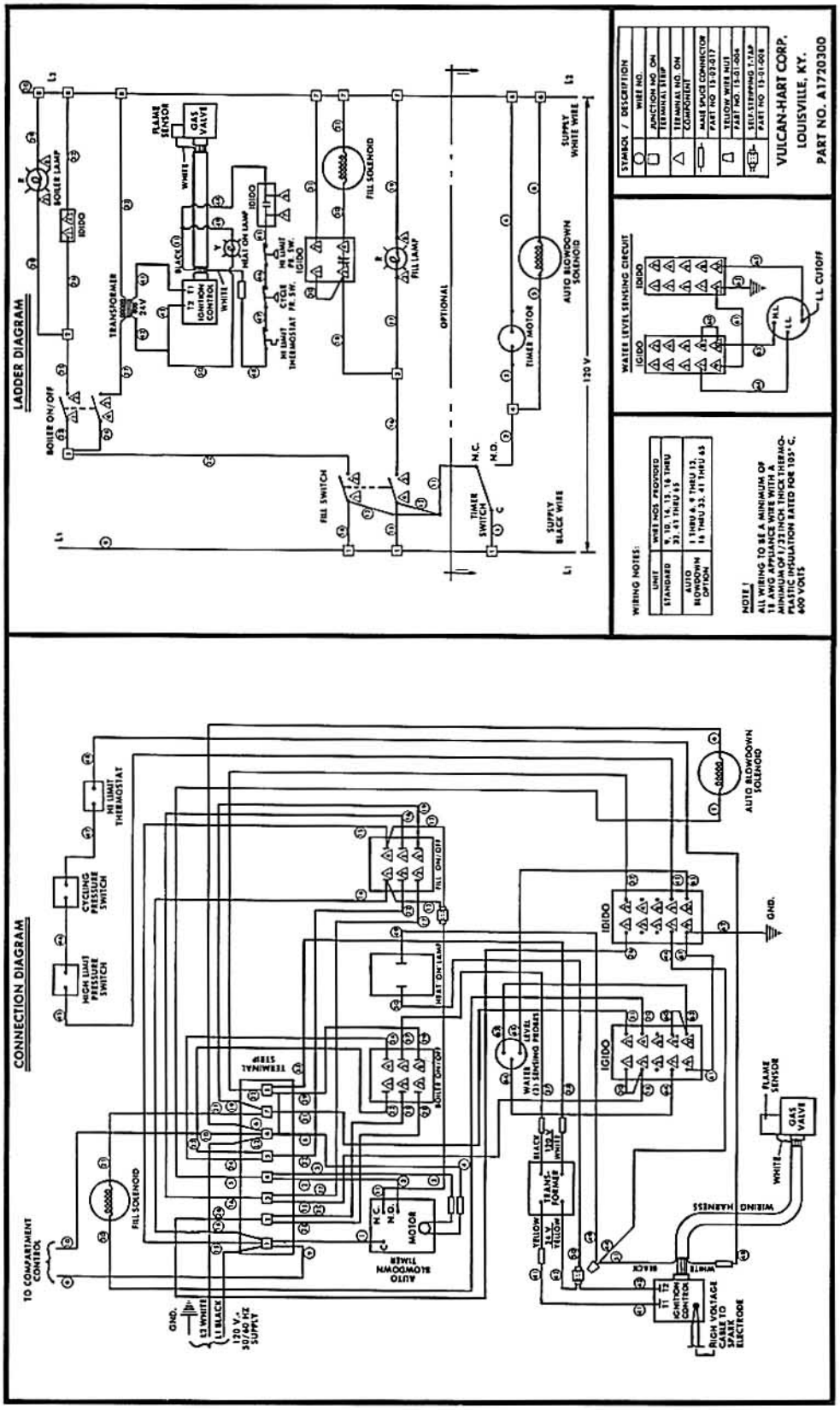
TROUBLESHOOTING: Doors and Compartments (Cont.)

PROBLEM	CAUSE	SOLUTION
9. Door gasket leaking.	Gasket retainer screws loose.	Tighten screws.
	Gasket at end of useful life. In normal use, gaskets should last a year or longer.	Replace with new gasket. From inside the door panel, loosen and remove all screws holding the stainless steel inner panels in place. Remove the inner panels, the old gasket, and replace with new gasket. This gasket must be installed flat and free of distortions. Tighten screws firmly, do not overtighten screws or the gasket will be distorted.
	Door screw dry, excessive friction prevents exerting pressure needed for sealing.	Lubricate door screw, use high temperature grease.
	Gasket edges not aligned with compartment front.	Door casting may be hanging improperly from its support. The door casting alignment with the compartment opening is adjustable. Lift off the door casting by the hooks and adjust the two ($2\frac{3}{8}$") diameter screws. Rehang door. Make sure the screws drop into the recesses on the pressure bar.

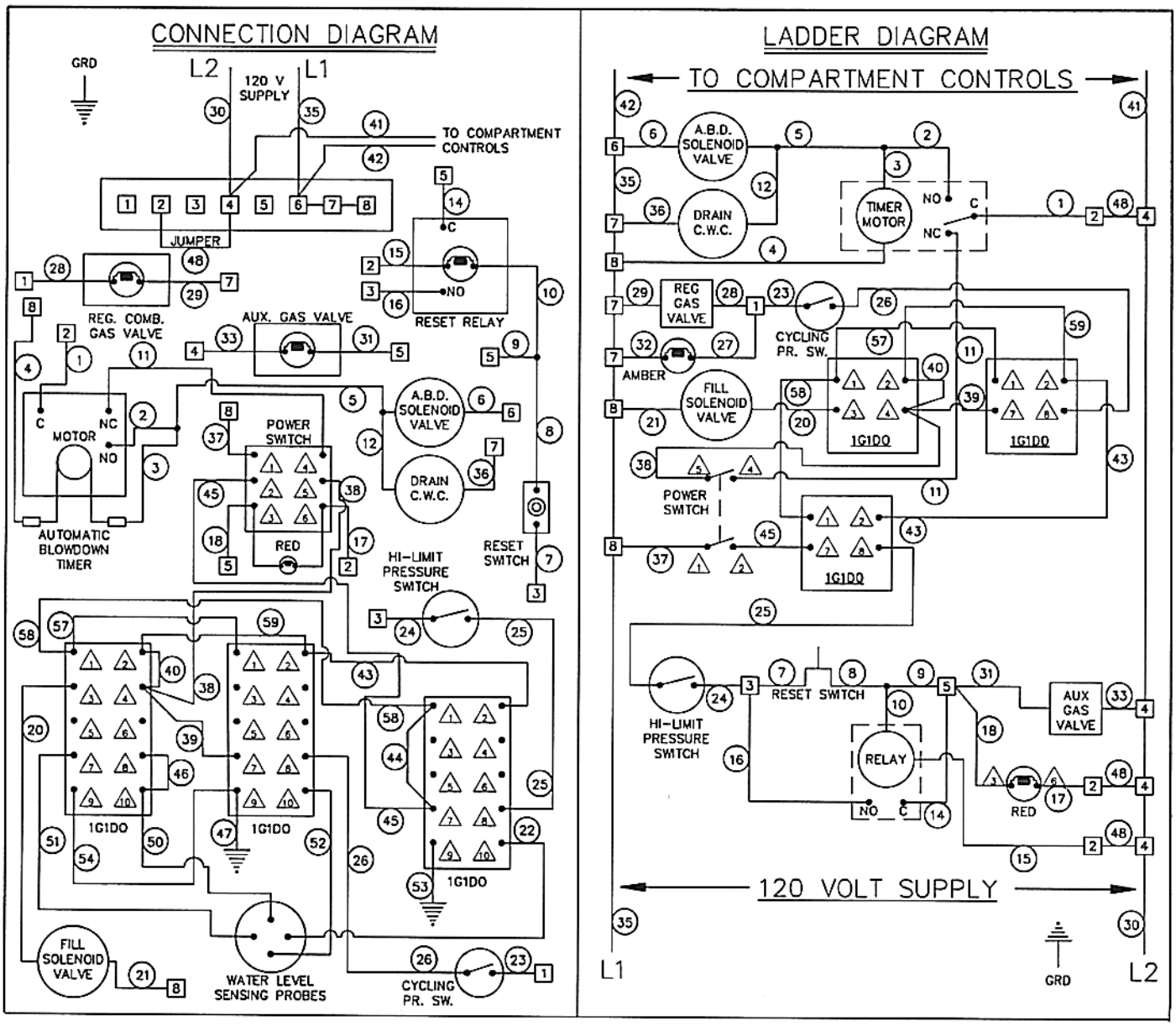
WIRING DIAGRAM:
Generator Controls, Standard Models



WIRING DIAGRAM:
Generator Controls, Electronic Ignition

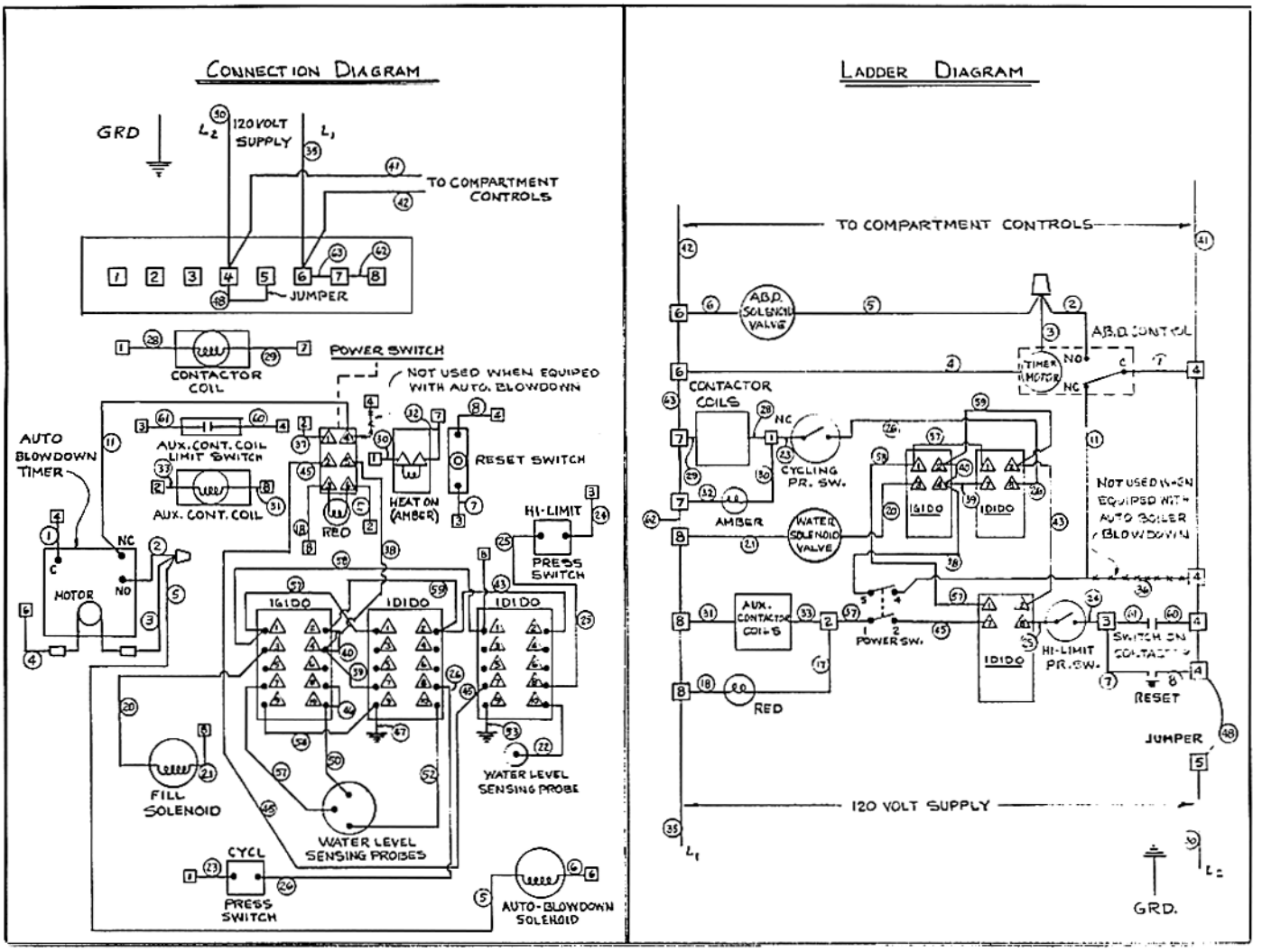


G. WIRING DIAGRAM:
Generator Controls, California Code, Gas



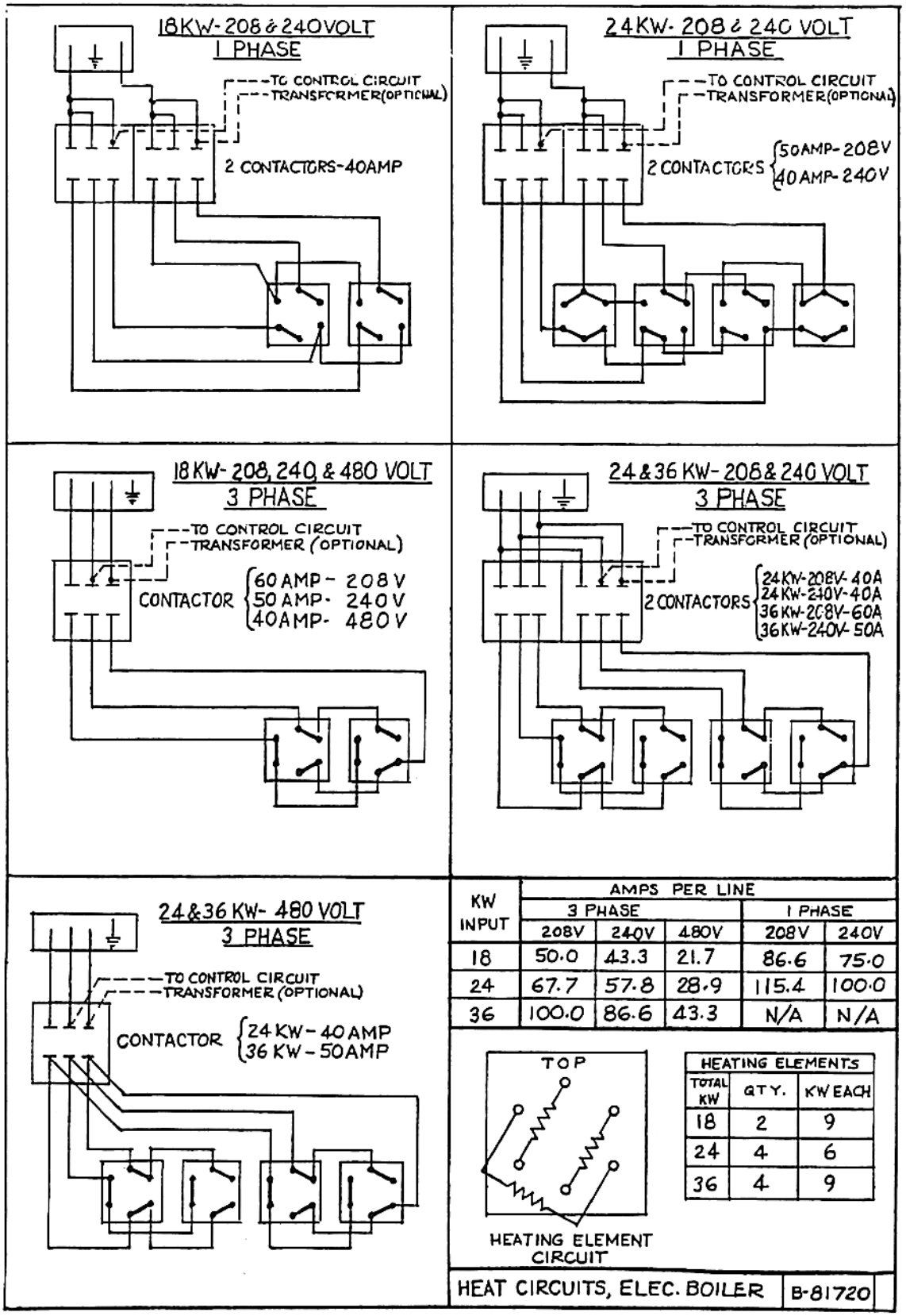
NOTE: ALL WIRING TO BE MINIMUM 18 AWG APPLIANCE WIRE WITH MINIMUM 1/32 THICK THERMOPLASTIC INSULATION RATED FOR 105° C AND 600 VOLTS.

WIRING DIAGRAM:
Generator Controls, California Code, Electric



NOTE: ALL WIRING TO BE MINIMUM 18 AWG APPLIANCE WIRE WITH MINIMUM OF 1/32" THICK THERMO PLASTIC INSULATION RATED FOR 105°C 600 VOLTS

WIRING DIAGRAM:
Heater Circuits for 18 KW, 24 KW & 36 KW Models

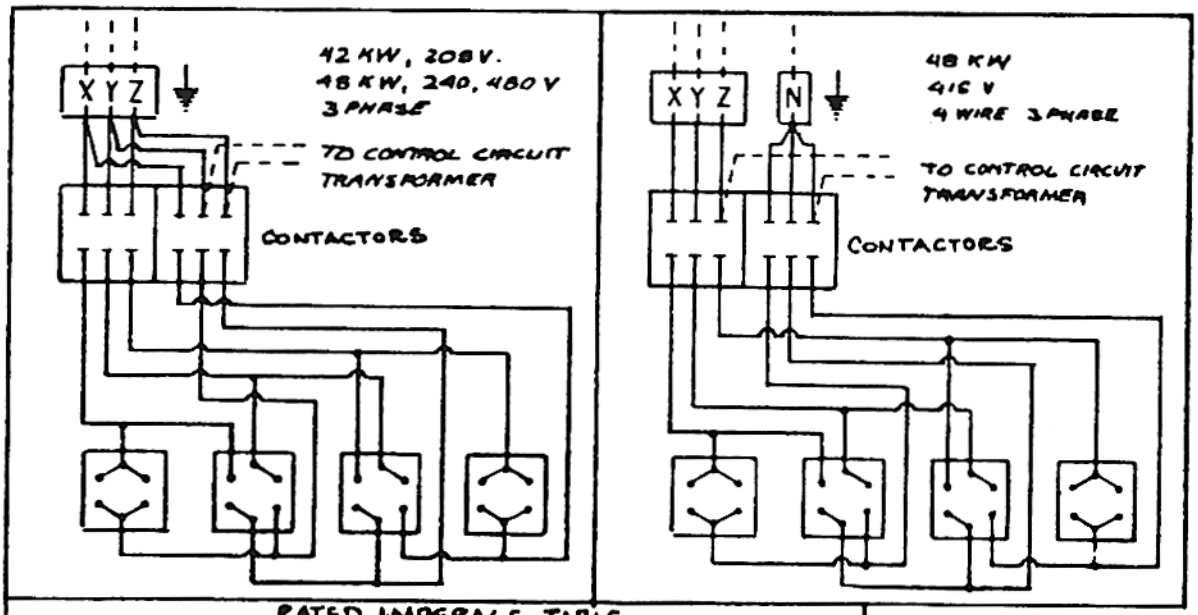


KW INPUT	AMPS PER LINE				
	3 PHASE			1 PHASE	
	208V	240V	480V	208V	240V
18	50.0	43.3	21.7	86.6	75.0
24	67.7	57.8	28.9	115.4	100.0
36	100.0	86.6	43.3	N/A	N/A

HEATING ELEMENTS		
TOTAL KW	QTY.	KW EACH
18	2	9
24	4	6
36	4	9

HEAT CIRCUITS, ELEC. BOILER | B-81720

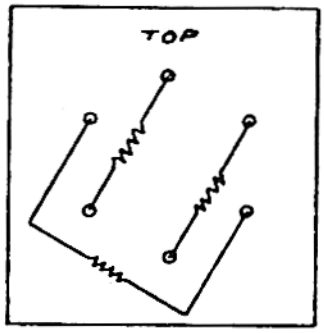
WIRING DIAGRAM:
Heater Circuits for 42 KW & 48 KW Models



RATED AMPERAGE TABLE

KW / AMP	3 PHASE								1 PHASE			
	208 V		240 V		480 V		415 V, 4 WIRE		208 V		240 V	
	I	AWG	I	AWG	I	AWG	I	AWG	I	AWG	I	AWG
42	118	4	—	—	—	—	—	—	—	—	—	—
48	—	—	117	4	59	8	69	4	—	—	—	—

HEATING ELEMENT CIRCUIT

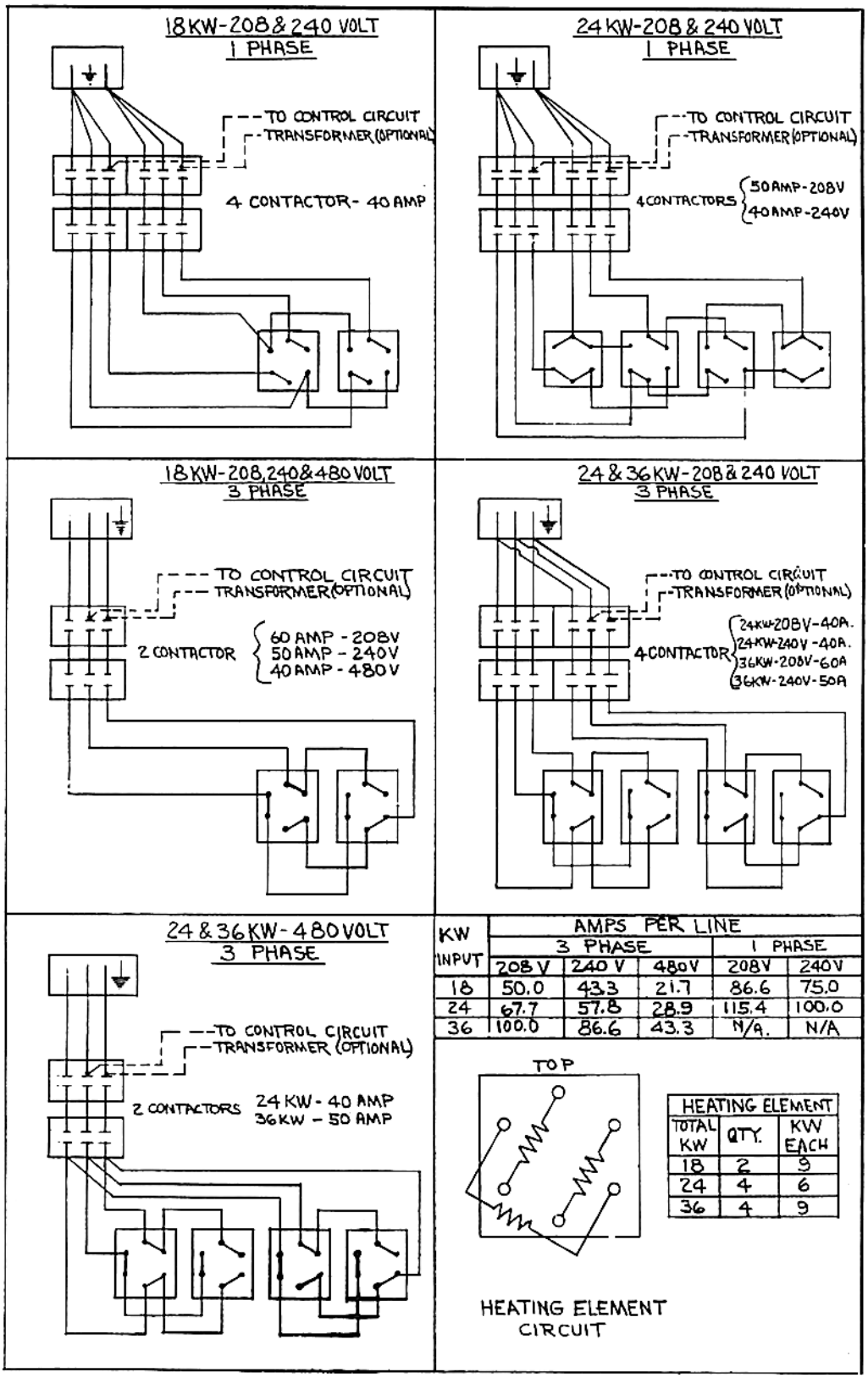


NOTE:

1. ALL WIRES TO BE RATED FOR MIN. 150°C, 600 V. WITH MIN. $\frac{1}{32}$" THK. WITH FIBERGLASS BRAID AND AWG SIZE AS LISTED ON "RATED AMPERAGE TABLE."
2. FOLLOW THE HEATING CIRCUIT THAT IS THE SAME AS INCOMING POWER SUPPLY AND THE RATING OF THE APPLIANCE.

TOTAL KW	HEATING ELEMENT	
	QTY	KW EA
42	4	10.5
48	4	12

WIRING DIAGRAM:
Heater Circuits for California Code

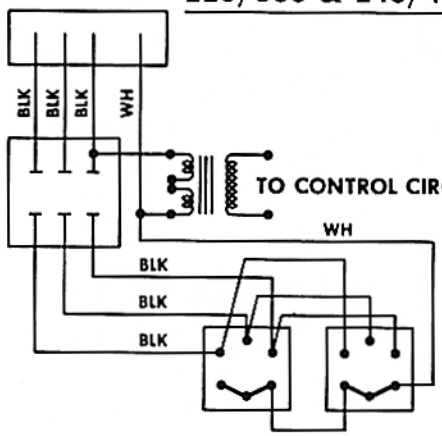


KW INPUT	AMPS PER LINE				
	3 PHASE			1 PHASE	
	208 V	240 V	480V	208V	240V
18	50.0	43.3	21.7	86.6	75.0
24	67.7	57.8	28.9	115.4	100.0
36	100.0	86.6	43.3	N/A.	N/A

HEATING ELEMENT		
TOTAL KW	QTY.	KW EACH
18	2	9
24	4	6
36	4	9

WIRING DIAGRAM:
Heater Circuits for 220/380 & 240/415 Volts

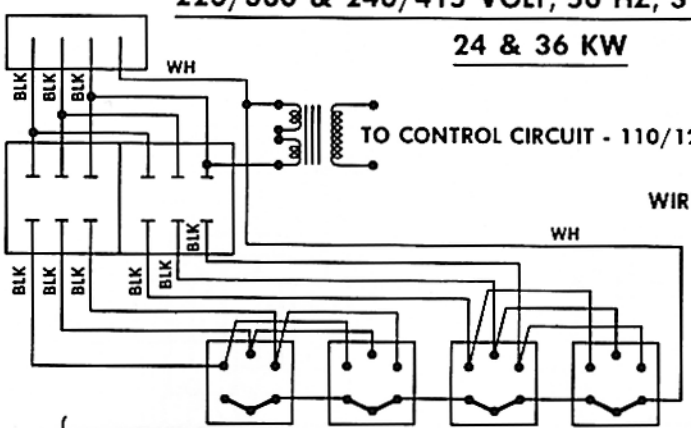
220/380 & 240/415 VOLT, 50 HZ, 3 PHASE, 4 WIRE
18 KW



CONTACTOR - 50 AMP

HEATING ELEMENTS - 9 KW EA - 240 VOLT

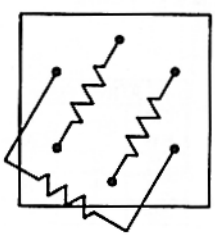
220/380 & 240/415 VOLT, 50 HZ, 3 PHASE, 4 WIRE
24 & 36 KW



CONTACTORS
- 40 AMP - 24 KW
- 50 AMP - 36 KW

HEATING ELEMENTS
- 6 KW EACH - 24 KW
- 9 KW EACH - 36 KW

TOTAL KW	AMPS PER LINE 220/380 - 240/415
18	43.3
24	57.8
36	86.6

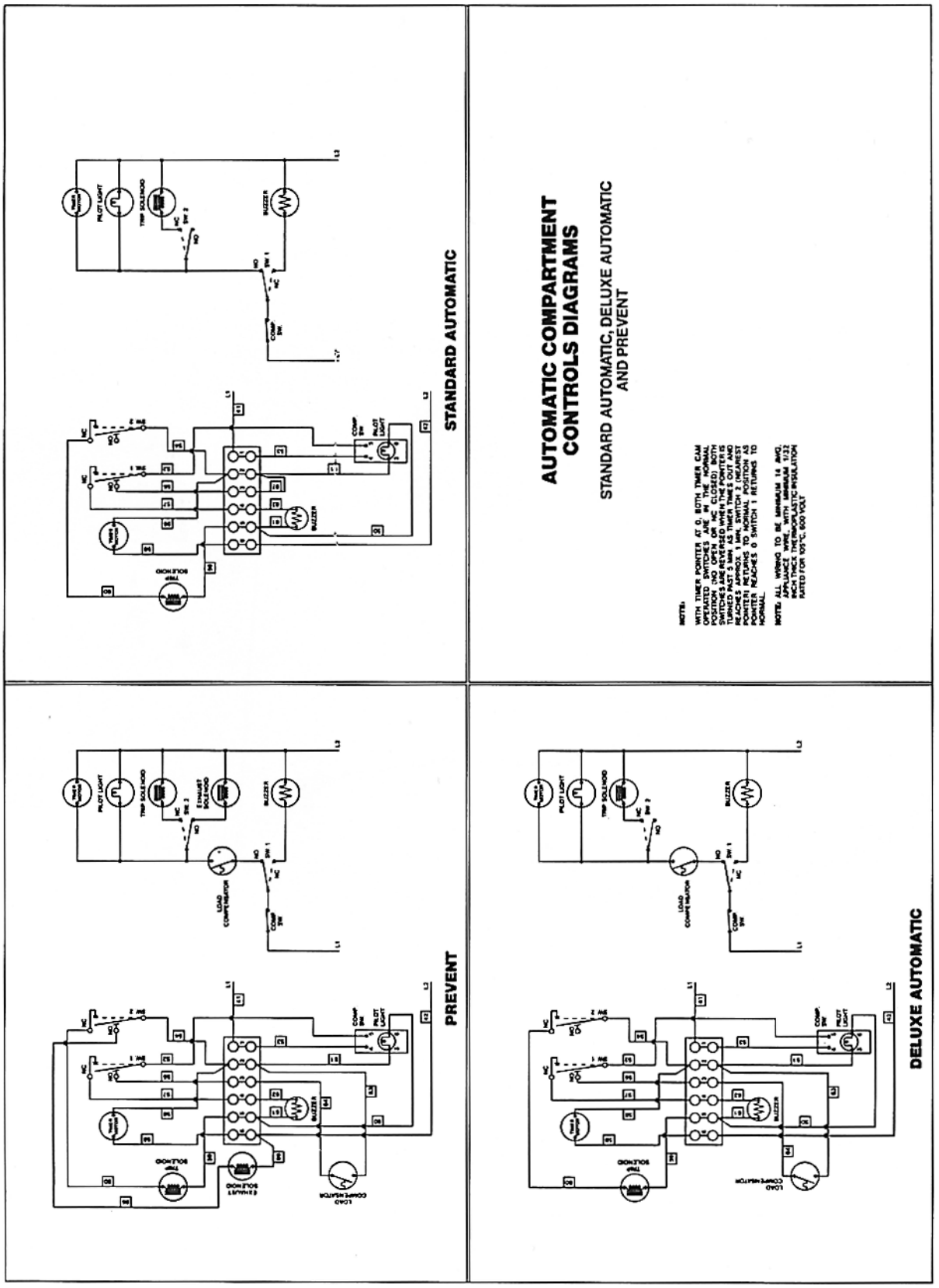


HEATING ELEMENT CIRCUIT

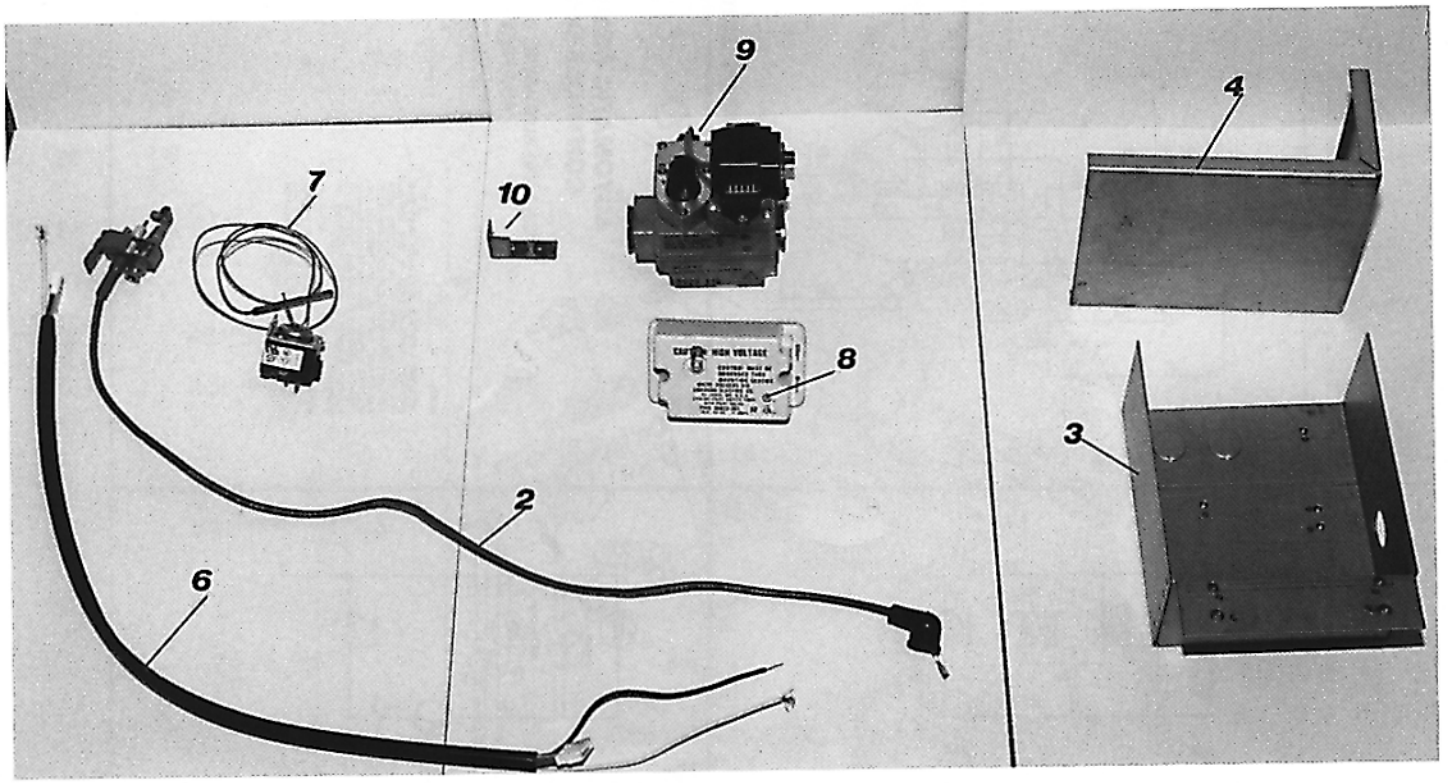
D - 81723

HEAT CIRCUITS, ELEC. BOILER - 220/380 & 240/415 VOLTS

WIRING DIAGRAM:
Compartment Controls


AUTOMATIC COMPARTMENT CONTROLS DIAGRAMS
STANDARD AUTOMATIC, DELUXE AUTOMATIC AND PREVENT
NOTE:
WITH TIMER POINTER AT 0, BOTH TIMER CAM OPERATED SWITCHES ARE IN THE NORMAL POSITION (NO OPEN OR NC CLOSED). BOTH SWITCHES ARE REVERSED WHEN THE POINTER IS TURNED FAST IN A CLOCKWISE DIRECTION AND REACHES APPROX. 1 MIN. SWITCH 2 (NEAREST TIMER MOTOR) TRANSFERS FIRST AND POINTER RETURNS TO NORMAL POSITION AS POINTER REACHES 0 SWITCH 1 RETURNS TO NORMAL.
NOTE: ALL WIRING TO BE MINIMUM 14 AWG, APPLIANCE WIRE, WITH MINIMUM 1/32 INCH WALL THICKNESS INSULATION RATED FOR 105°C, 600 VOLT
STANDARD AUTOMATIC
PREVENT
DELUXE AUTOMATIC

PARTS LIST:
Electronic Ignition

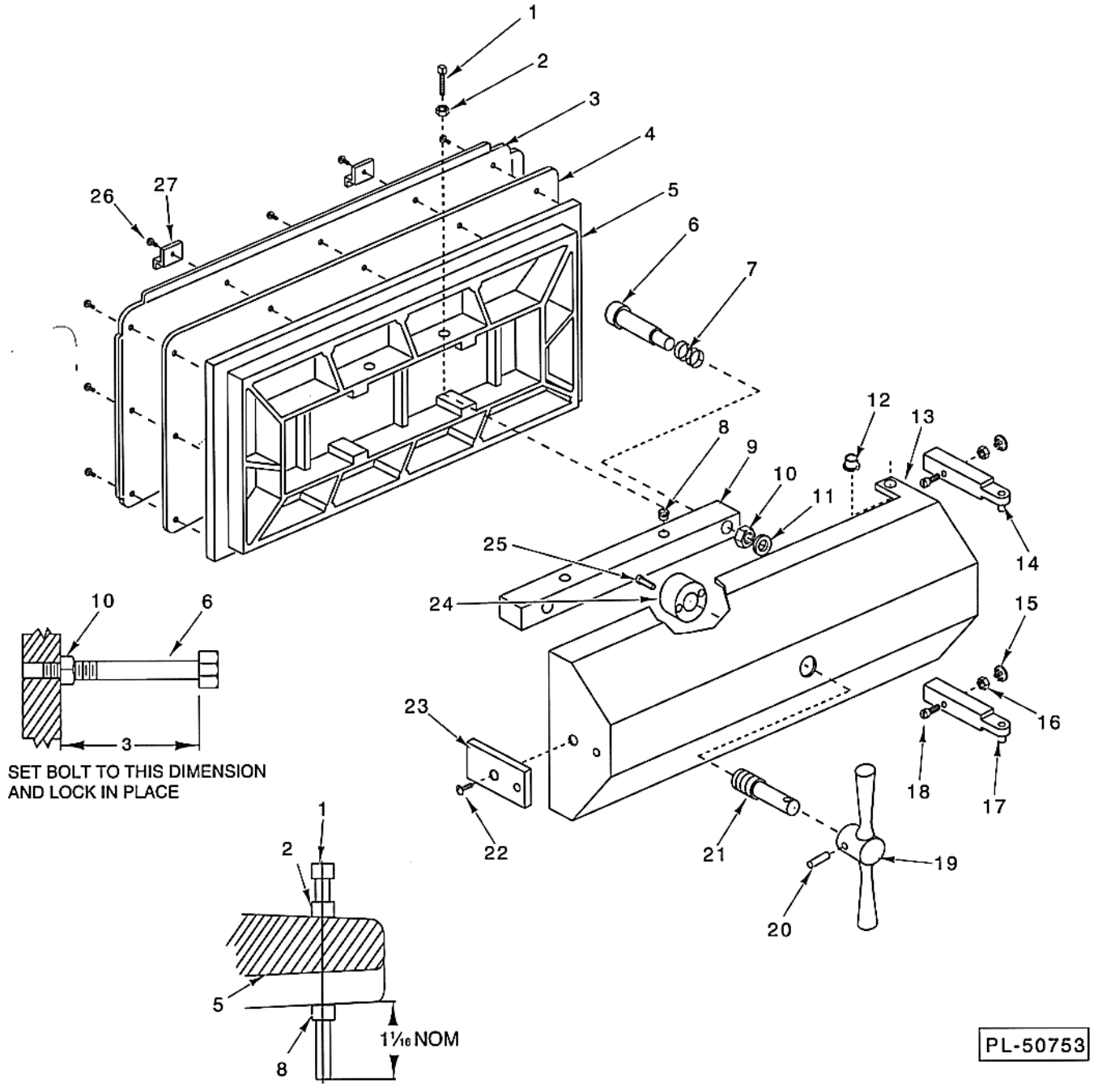


PARTS LIST:
Electronic Ignition — (Gas Steamers)

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50607	PART NO.	NAME OF PART	AMT.
1	821089-1	Orifice - Natural Gas Pilot	1
1	821089-2	Orifice - LP Pilot	1
2	821089-3	Pilot Body - Electronic Ignition System	1
2	817363-1	Pilot Body - Standard Ignition System	1
3	817208-1	Box - Electronic Ignition	1
4	817209	Cover - Ignition Box	1
5	821075	Transformer	1
6	821076	Harness - Wiring	1
7	821077	Sensor - Flame	1
8	821078	Control - Ignition	1
9	817362-1	Valve - Gas (LP)(Elect. Ignition)	1
9	836914-2	Valve - Gas (LP)(Standard Ignition)	1
9	817362-2	Valve - Gas (Natural)(Elect. Ignition)	1
9	836914-1	Valve - Gas (Natural)(Standard Ignition)	1
10	817916	Bracket - Mounting	1

PARTS LIST:
Steamer Compartment Door — Previous Construction

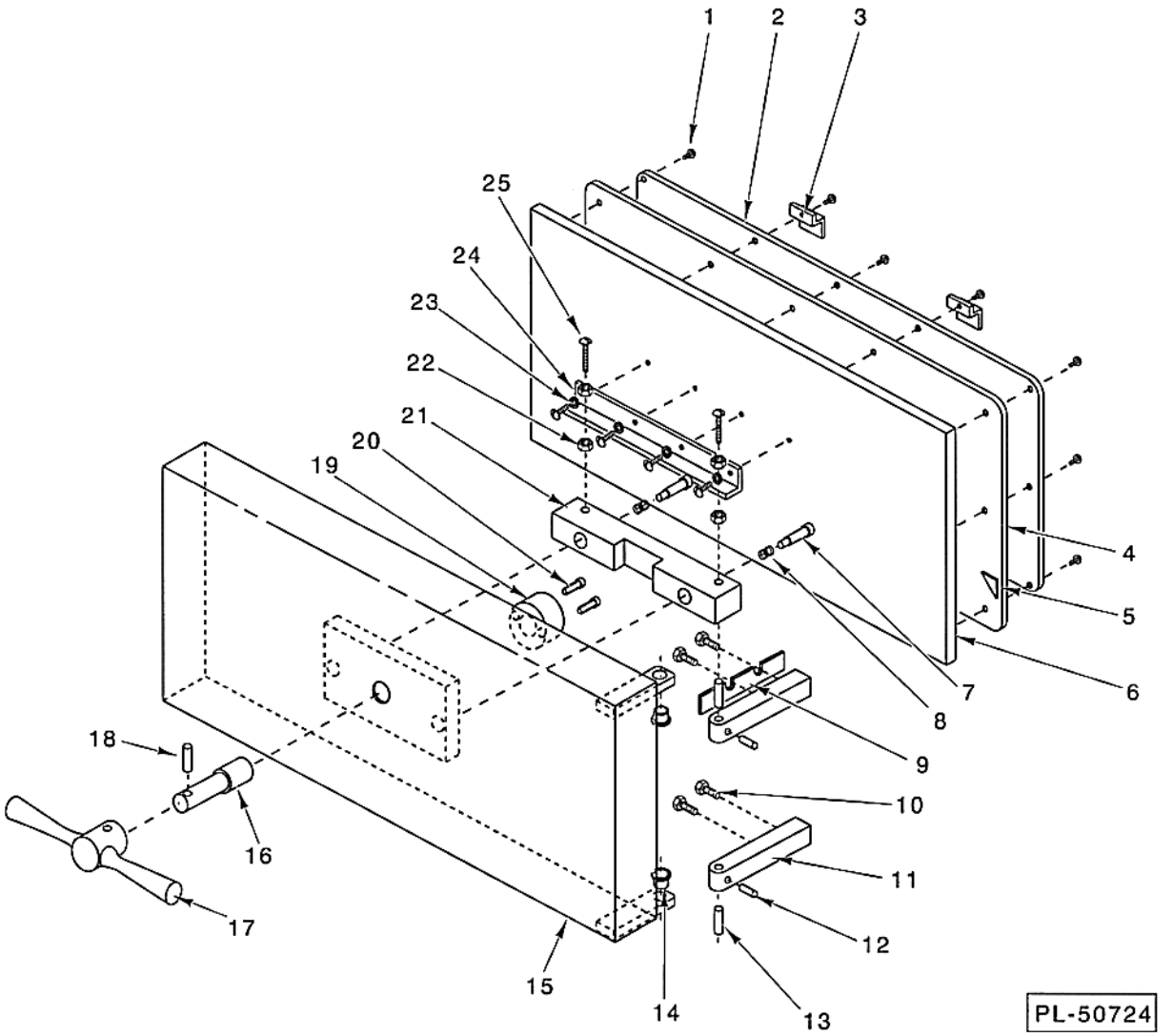


PARTS LIST:
Steamer Compartment Door — Previous Construction

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50753	PART NO.	NAME OF PART	AMT.
1	SC-48-55	Set Screw 3/8-16 x 2 1/2 Sq.Hd. Cup Pt.	2
2	NS-18-14	Jam Nut 3/8-16 Hex	2
3	881625	Retainer - Gasket	1
4	881624	Gasket - Door	1
5	881614	Casting - Door	1
6	SC-119-26	Cap Screw 1/2-13 x 3 1/2 Hex Hd.	2
7	881627	Spring - Compression	2
8	NS-31-33	Stop Nut 3/8-16 "Elastic"	2
9	881628	Bar - Pressure	1
10	NS-15-20	Nut 1/2-13 Hex	4
11	WL-6-36	Lockwasher 1/2	4
12	817643	Bearing - Flanged (Bronze)	2
13	817608	Cover - Door Weldment	1
14	817603-1	Hinge - Door (Top)	1
15	PB-3-1	Plug - Hole	4
16	NS-31-33	Stop Nut 3/8-16 "Elastic"	4
17	817603-2	Hinge - Door (Bottom)	1
18	881861	Bolt - Hinge "Special"	4
19	881630	Handle - Door	1
20	RP-3-36	Roll Pin 5/16 x 1 1/2	1
21	880091	Screw - Door	1
22	SC-119-68	Mach. Screw 1/2-13 x 1 3/4 Flat Hd.	2
23	881188	Plate - Latch Strike	1
24	881626	Nut - Door (Bronze)	1
25	SC-59-30	Cap Screw 1/4-20 x 1 Hex Hd.	2
26	SC-53-41	Mach. Screw 1/4-20 x 1/2 Truss Hd. SST	12
27	881629	Hook - Lift	1
	880786	Lubricant - Door Screw (Tube)	1

PARTS LIST:
Steamer Compartment Door — Current Construction

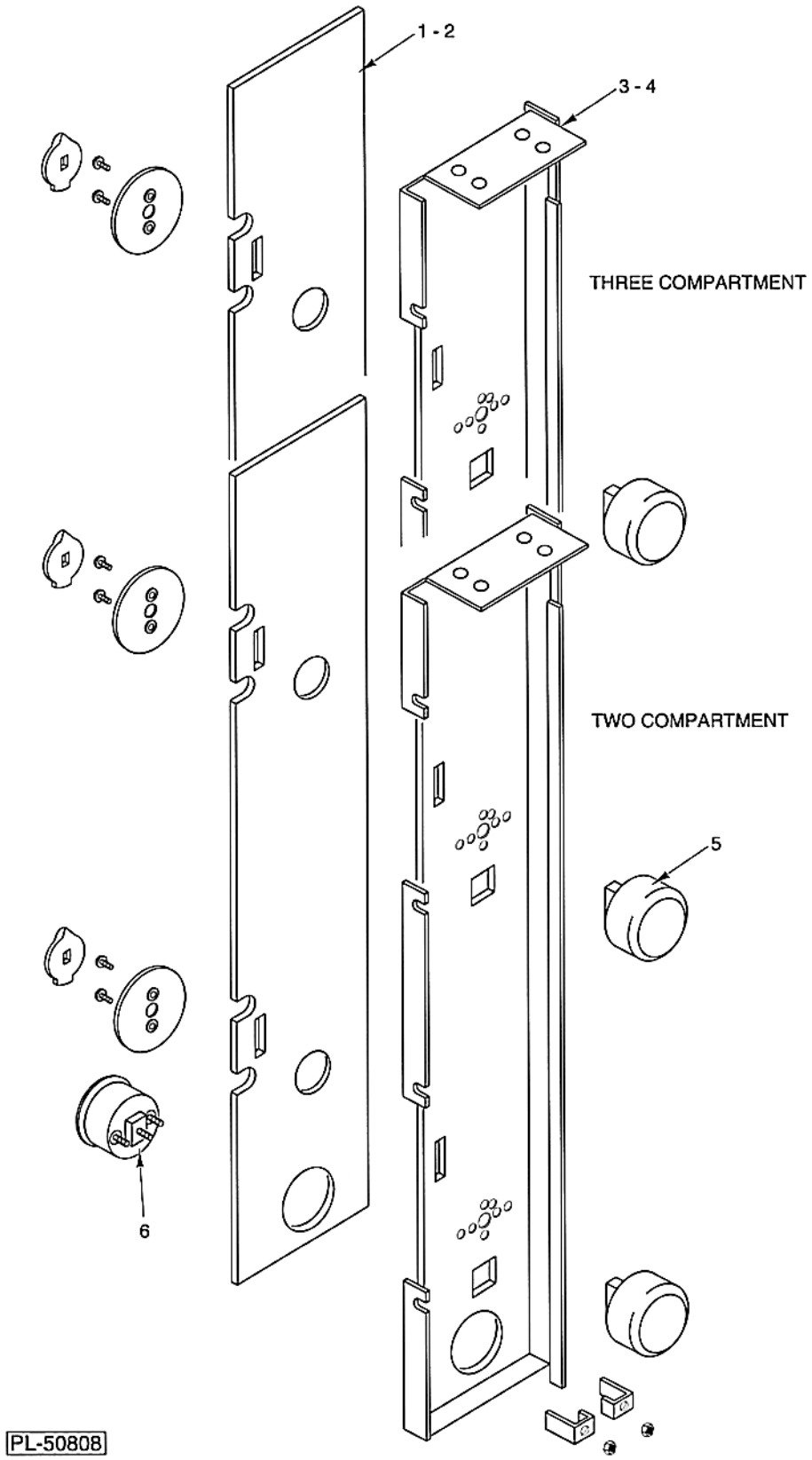


PARTS LIST:
Steamer Compartment Door — Current Construction

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50724	PART NO.	NAME OF PART	AMT.
1	SC-53-41	Mach. Screw 1/4-20 x 1/2 Truss Hd. SST	16
2	881625	Retainer - Gasket	1
3	881629	Hook - Lift	2
4	881624	Gasket - Door	1
5	843934	Shims	AR
6	356708-1	Plate - Inner Door	1
7	SC-86-24	Shoulder Screw 1/2 D x 1 1/2 L Socket Hex Hd.	2
8	881627	Spring - Compression	2
9	843935	Shims	AR
10	356718-1	Bolt - Hinge "Special"	4
11	356717-1	Block - Hinge	2
12	RP-2-10	Roll Pin 3/16 Dia. x 1 Lg.	2
13	356716-1	Pin - Hinge	2
14	817643	Bearing - Flanged (Bronze)	2
15	356707-1	Door Weldment	1
16	880091	Screw - Door	1
17	881630	Handle - Door	1
18	RP-3-36	Roll Pin 5/16 x 1 1/2	1
19	881626	Nut - Door (Bronze)	1
20	SC-59-30	Cap Screw 1/4-20 x 1 Hex Hd.	2
21	356714-1	Bar - Pressure	1
22	NS-17-8	Jam Nut 5/16-18 Hex	4
23	WL-3-38	Lockwasher 1/4 Medium	4
24	356715-1	Angle - Inner Door Mtg.	1
25	SC-98-2	Mach. Screw 5/16-18 x 1 3/4 Rd.Hd.	2
	880786	Lubricant - Door Screw (Tube)	1

PARTS LIST:
Control Panel — Manual Control

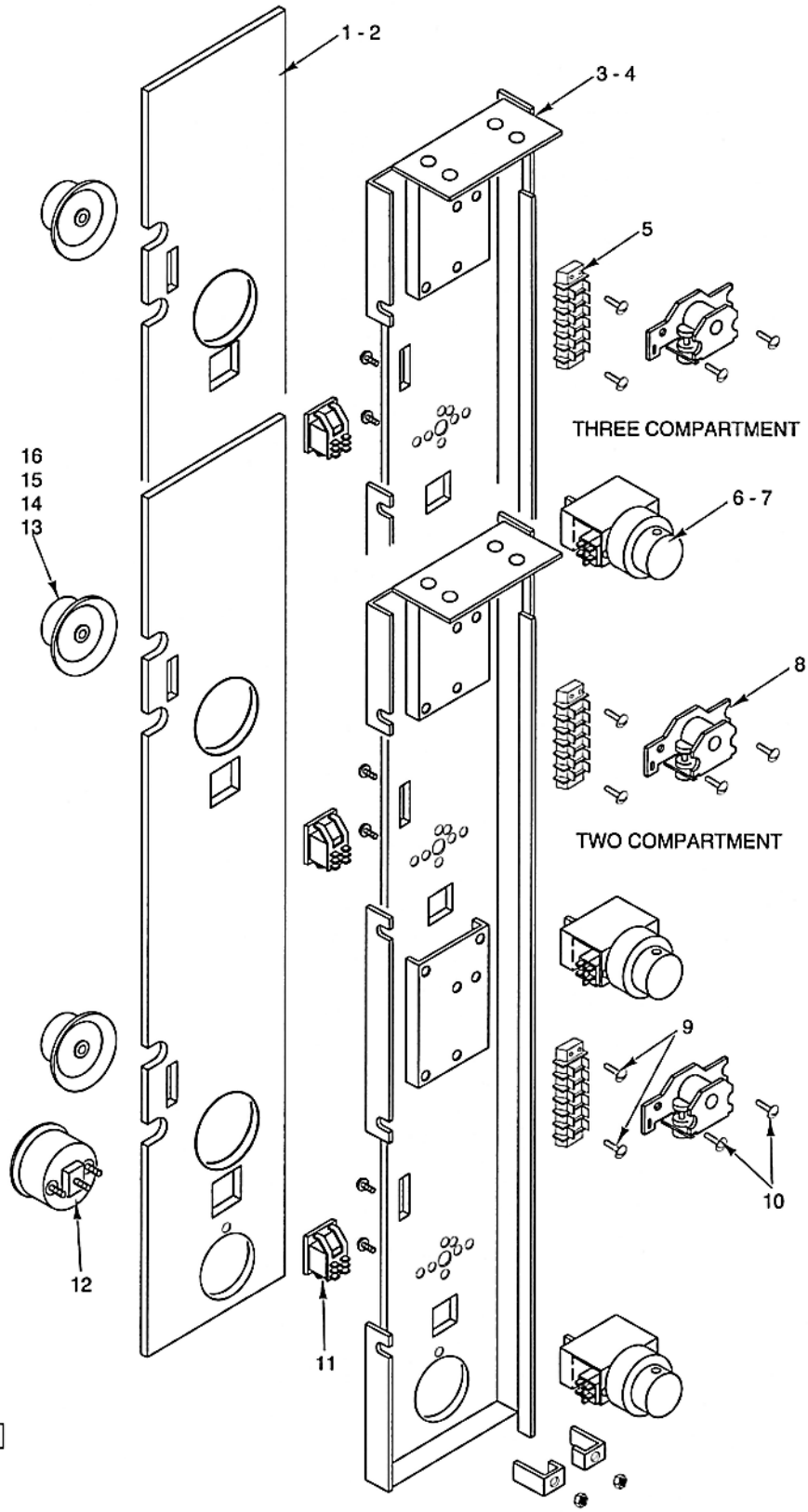


PARTS LIST:
Control Panel — Manual Control

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50808	PART NO.	NAME OF PART	AMT.
1	881635-11	Panel - Nameplate (2 Compartment)	1
2	881635-12	Panel - Nameplate (3 Compartment)	1
3	881622-1	Panel - Mounting (2 Compartment)	1
4	881622-3	Panel - Mounting (3 Compartment)	1
5	880108	Timer (Incls. Panel,Screws & Knob)	2
6	833152	Gauge - Pressure (Incls. Bracket & Nuts)	1

PARTS LIST:
Control Panel — Auto Deluxe, Pre-vent Controls



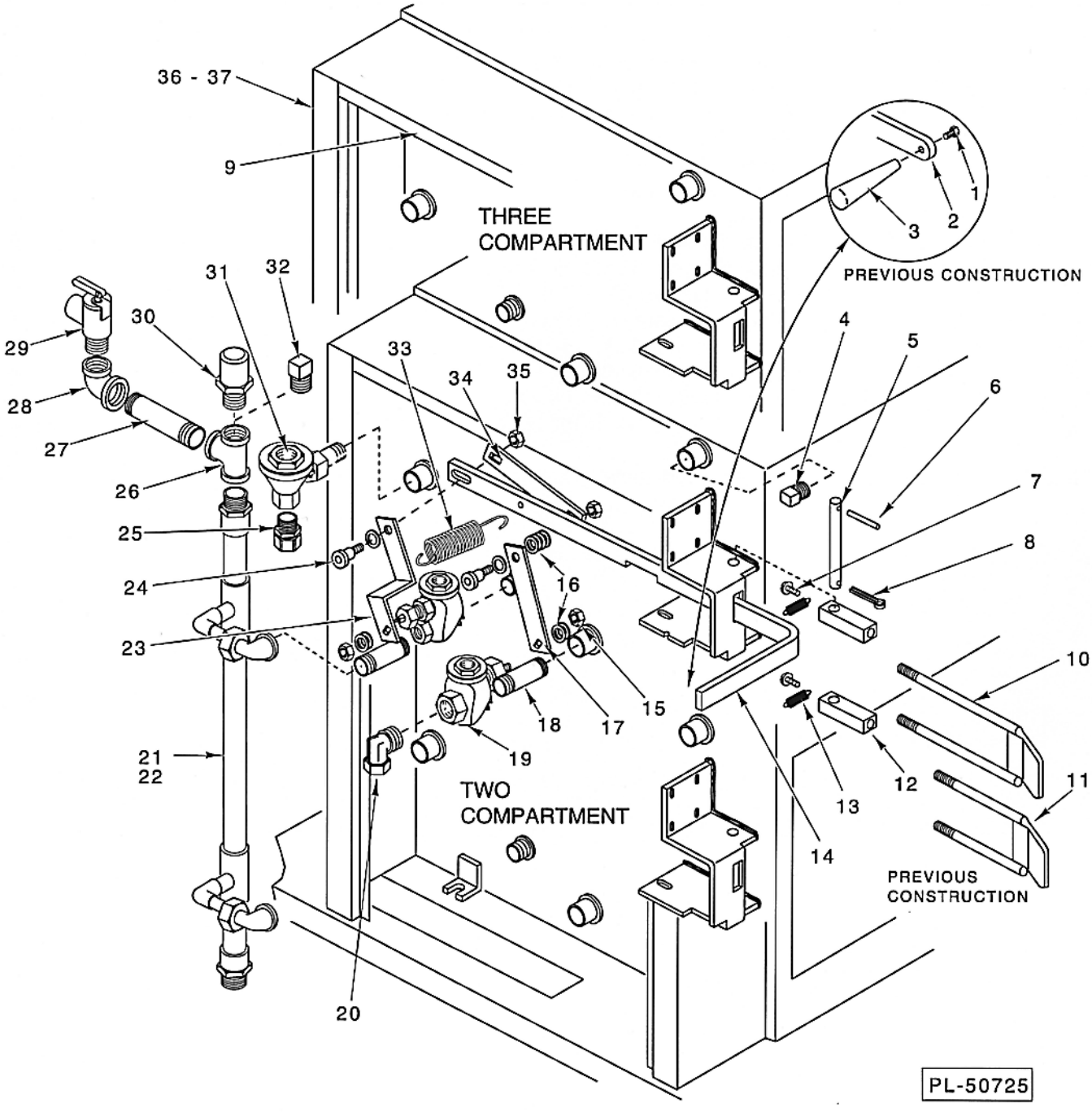
PARTS LIST:
Control Panel — Auto Deluxe, Pre-vent Controls

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50809	PART NO.	NAME OF PART	AMT.
1	881607-11	Panel - Nameplate (2 Compartment)	1
2	881607-12	Panel - Nameplate (3 Compartment)	1
3	881622-1	Panel - Mounting (2 Compartment)	1
4	881622-3	Panel - Mounting (3 Compartment)	1
5	881604	Strip - Terminal	2
6	881601	Timer - 60 Minute	2
7	817217	Timer - 15 Minute	2
8	880009	Buzzer	2
9	SC-119-72	Mach. Screw 8-32 x ½ Fil. Hd.	4
10	SC-119-72	Mach. Screw 8-32 x ½ Fil. Hd.	4
11	881579	Switch - Lighted (On/Off)	2
12	833152	Gauge - Pressure 0-31 P.S.I. 1/4 MPT	1
13	881669-10	Knob - Timer (60 Min., 60 Hz.)	2
14	881669-11	Knob - Timer (60 Min., 50 Hz.)	2
15	817179-1	Knob - Timer (15 Min., 60 Hz.)	2
16	817179-2	Knob - Timer (15 Min., 50 Hz.)	2

* Note: Quantities for 2 compartment are used above. Quantities for 3 compartment will vary.

PARTS LIST:
Compartment Controls — Manual

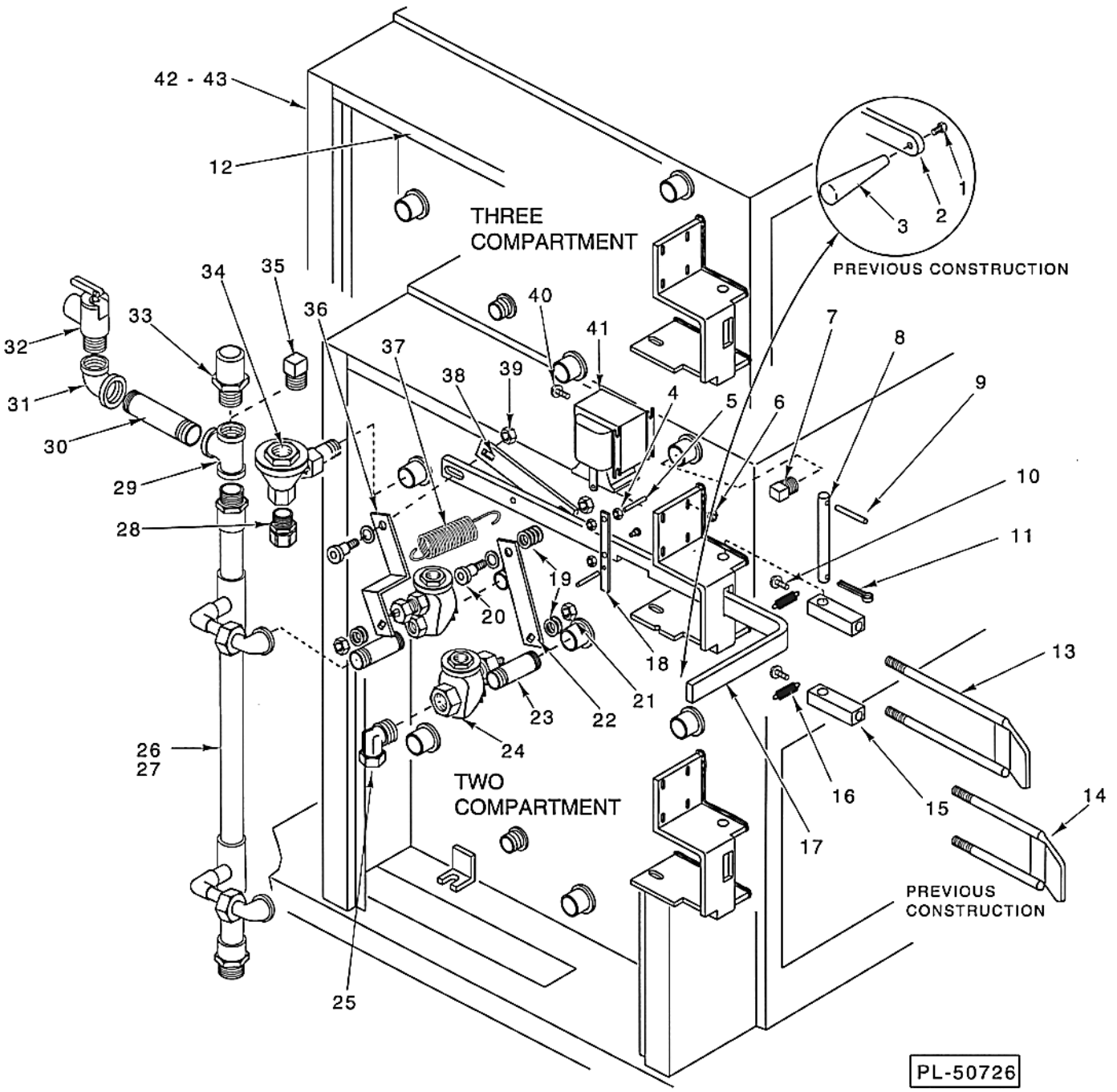


PARTS LIST:
Compartment Controls — Manual

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50725	PART NO.	NAME OF PART	AMT.
1	SC-41-30	Cap Screw 3/8-16 x 1 Hex Hd. SST	AR
2	881595	Arm - Pull (Previous Construction)	AR
3	880043	Handle	AR
4	FP-84-8	Plug - Pipe 1/2	AR
5	881648	Pin - Pivot	AR
6	911046-8	Pin - Roll 1/8 x 1 1/2	AR
7	SC-53-3	Mach. Screw 10-24 x 3/4 Truss Hd., Slotted	AR
8	PC-3-56	Cotter Pin 1/8 x 1	AR
9	881606-11	Top - Control Housing	1
10	356720-1	Latch - Door Weldment (Current Construction)	AR
11	881592-1	Latch - Door Weldment (Previous Construction)	AR
12	881590	Pivot - Latch	AR
13	880262	Spring - Door Catch	AR
14	356719-1	Arm - Pull (Current Construction)	AR
15	NS-31-21	Stop Nut - Special 1/4-20 Hex	AR
16	WS-18-37	Washer	AR
17	881823	Arm - Valve Control	AR
18	FP-54-39	Nipple - Pipe 1/2 x 2 1/2	AR
19	881675	Valve - Gate	AR
20	FP-47-42	Fitting - 90 Degree Male Elbow 1/2 x 1/2 M.P.T.	AR
21	881598-1	Header - Inlet (2 Compartment)	1
22	881598-2	Header - Inlet (3 Compartment)	1
23	881594	Arm - Valve	AR
24	SC-86-5	Shoulder Screw 3/8 D x 3/8 L Socket Hex Hd.	AR
25	FP-47-9	Fitting - Tube 1/2 TBG x 1/2 MPT	AR
26	FP-19-28	Tee 3/4 Bronze	1
27	FP-43-77	Nipple 3/4 x 4 Lg. (T.B.E.)	1
28	FP-15-23	Elbow 3/4 x 90 Deg. Brass	1
29	880026	Pressure Relief Valve (3/4)	1
30	881760	Breaker - Vacuum (Only On Unit With Boilers)	1
31	880016	Trap - Steam 1/2	AR
32	FP-28-19	Plug - Pipe 3/4 (Only On Direct Steam Units)	1
33	881429	Spring	AR
34	881593	Link - Arm	AR
35	NS-3-29	Nut 5/16-18 "Elastic"	AR
36	881898-1	Back - Control Housing (2 Compartment)	1
37	881898-2	Back - Control Housing (3 Compartment)	1

PARTS LIST:
Compartment Controls — Standard Auto

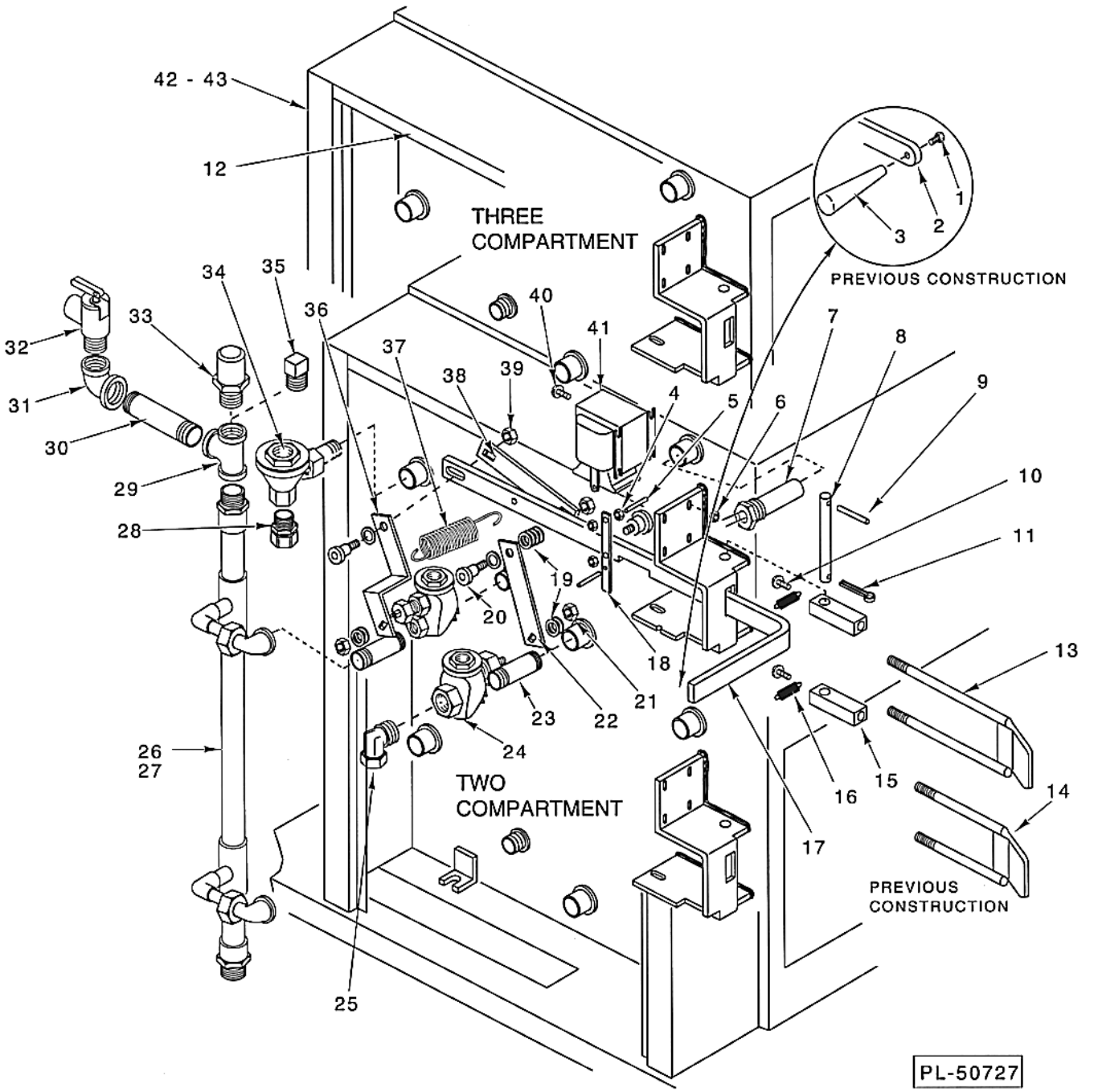


PARTS LIST:
Compartment Controls — Standard Auto

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50726	PART NO.	NAME OF PART	AMT.
1	SC-41-30	Cap Screw 3/8-16 x 1 Hex Hd. SST	AR
2	881595	Arm - Pull (Previous Construction)	AR
3	880043	Handle (Previous Construction)	AR
4	NS-46-38	Nut - Lock 1/4-20 Hex	AR
5	RP-3-8	Roll Pin 3/16 Dia. x 1 1/8 Lg	AR
6	NS-31-15	Stop Nut - Special 10-24 Hex (SST)	AR
7	FP-84-8	Plug - Pipe 1/2	AR
8	881648	Pin - Pivot	AR
9	911046-8	Pin - Roll 1/8 x 1 1/2	AR
10	SC-53-3	Mach. Screw 10-24 x 3/4 Truss Hd., Slotted	AR
11	PC-3-56	Cotter Pin 1/8 x 1	AR
12	881606-11	Top - Control Housing	1
13	356720-1	Latch - Door Weldment (Current Construction)	AR
14	881592-1	Latch - Door Weldment (Previous Construction)	AR
15	881590	Pivot - Latch	AR
16	880262	Spring - Door Catch	AR
17	356719-1	Arm - Pull (Current Construction)	AR
18	881426	Solenoid - Arm Lift	AR
19	WS-18-37	Washer	AR
20	SC-86-5	Shoulder Screw 3/8 D x 3/8 L Socket Hex Hd.	AR
21	NS-31-21	Stop Nut - Special 1/4-20 Hex	AR
22	881823	Arm - Valve Control	AR
23	FP-54-39	Nipple - Pipe 1/2 x 2 1/2	AR
24	881675	Valve - Gate	AR
25	FP-47-42	Fitting - 90 Degree Male Elbow 1/2 x 1/2 M.P.T.	AR
26	881598-1	Header - Inlet (2 Compartment)	1
27	881598-2	Header - Inlet (3 Compartment)	1
28	FP-47-9	Fitting - Tube 1/2 TBG x 1/2 MPT	AR
29	FP-19-28	Tee 3/4 Bronze	1
30	FP-43-77	Nipple 3/4 x 4 Lg. (T.B.E.)	1
31	FP-15-23	Elbow 3/4 x 90 Deg. Brass	1
32	880026	Pressure Relief Valve (3/4)	1
33	881760	Breaker - Vacuum (Only On Units With Boilers)	1
34	880016	Trap - Steam 1/2	AR
35	FP-28-19	Plug - Pipe 3/4 (Only On Direct Steam Units)	1
36	881594	Arm - Valve	AR
37	881429	Spring	AR
38	881593	Link - Arm	AR
39	NS-3-29	Nut 5/16-18 "Elastic"	AR
40	SC-53-2	Mach. Screw 10-24 x 1/2 Truss Hd. SST	AR
41	881414	Solenoid - Steam Control	AR
42	881898-1	Back - Control Housing (2 Compartment)	1
43	881898-2	Back - Control Housing (3 Compartment)	1

PARTS LIST:
Compartment Controls — Deluxe Auto

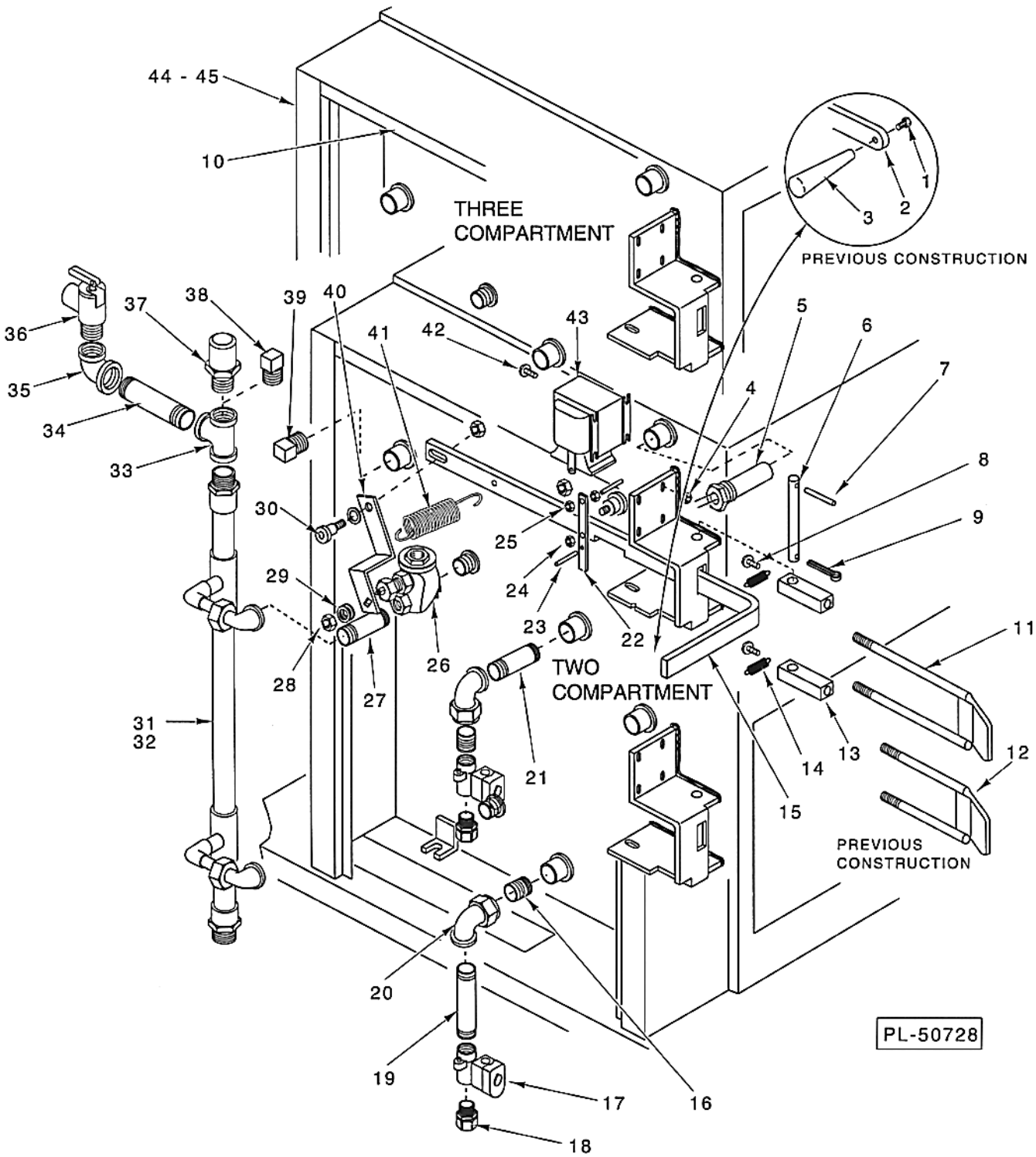


PARTS LIST:
Compartment Controls — Deluxe Auto

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50727	PART NO.	NAME OF PART	AMT.
1	SC-41-30	Cap Screw 3/8-16 x 1 Hex Hd. SST	AR
2	881595	Arm - Pull (Previous Construction)	AR
3	880043	Handle (Previous Construction)	AR
4	NS-46-38	Nut - Lock 1/4-20 Hex	AR
5	RP-3-8	Roll Pin 3/16 Dia. x 1 1/8 Lg	AR
6	NS-31-15	Stop Nut - Special 10-24 Hex (SST)	AR
7	880015	Switch - Thermal	AR
8	881648	Pin - Pivot	AR
9	911046-8	Pin - Roll 1/8 x 1 1/2	AR
10	SC-53-3	Mach. Screw 10-24 x 3/4 Truss Hd., Slotted	AR
11	PC-3-56	Cotter Pin 1/8 x 1	AR
12	881606-11	Top - Control Housing	1
13	356720-1	Latch - Door Weldment (Current Construction)	AR
14	881592-1	Latch - Door Weldment (Previous Construction)	AR
15	881590	Pivot - Latch	AR
16	880262	Spring - Door Catch	AR
17	356719-1	Arm - Pull (Current Construction)	AR
18	881426	Solenoid - Arm Lift	AR
19	WS-18-37	Washer	AR
20	SC-86-5	Shoulder Screw 3/8 D x 3/8 L Socket Hex Hd.	AR
21	NS-31-21	Stop Nut - Special 1/4-20 Hex	AR
22	881823	Arm - Valve Control	AR
23	FP-54-39	Nipple - Pipe 1/2 x 2 1/2	AR
24	881675	Valve - Gate	AR
25	FP-47-42	Fitting - 90 Degree Male Elbow 1/2 x 1/2 M.P.T.	AR
26	881598-1	Header - Inlet (2 Compartment)	1
27	881598-2	Header - Inlet (3 Compartment)	1
28	FP-47-9	Fitting - Tube 1/2 TBG x 1/2 MPT	AR
29	FP-19-28	Tee 3/4 Bronze	1
30	FP-43-77	Nipple 3/4 x 4 Lg. (T.B.E.)	1
31	FP-15-23	Elbow 3/4 x 90 Deg. Brass	1
32	880026	Pressure Relief Valve (3/4)	1
33	881760	Breaker - Vacuum (Only On Units With Boilers)	1
34	880016	Trap - Steam 1/2	AR
35	FP-28-19	Plug - Pipe 3/4 (Only On Direct Steam Units)	1
36	881594	Arm - Valve	AR
37	881429	Spring	AR
38	881593	Link - Arm	AR
39	NS-3-29	Nut 5/16-18 "Elastic"	AR
40	SC-53-2	Mach. Screw 10-24 x 1/2 Truss Hd. SST	AR
41	881414	Solenoid - Steam Control	AR
42	881898-1	Back - Control Housing (2 Compartment)	1
43	881898-2	Back - Control Housing (3 Compartment)	1

PARTS LIST:
Compartment Controls — Pre-Vent

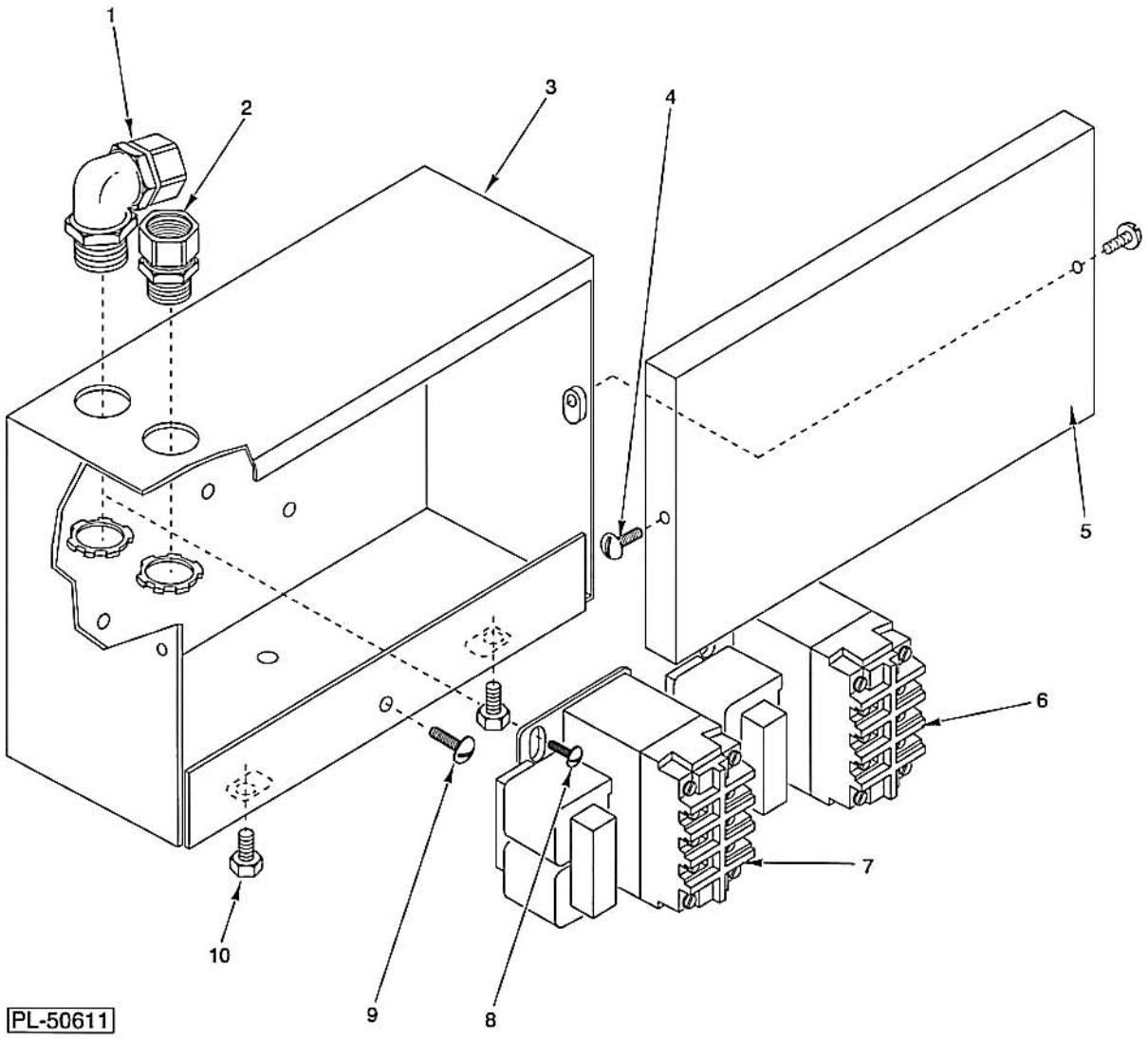


PARTS LIST:
Compartment Controls — Pre-Vent

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50728	PART NO.	NAME OF PART	AMT.
1	SC-41-30	Cap Screw 3/8-16 x 1 Hex Hd. SST	AR
2	881595	Arm - Pull (Previous Construction)	AR
3	880043	Handle (Previous Construction)	AR
4	NS-31-15	Stop Nut - Special 10-24 Hex (SST)	AR
5	880015	Switch - Thermal	AR
6	881648	Pin - Pivot	AR
7	911046-8	Pin - Roll 1/8 x 1 1/2	AR
8	SC-53-3	Mach. Screw 10-24 x 3/4 Truss Hd., Slotted	AR
9	PC-3-56	Cotter Pin 1/8 x 1	AR
10	881606-11	Top - Control Housing	1
11	356720-1	Latch - Door Weldment (Current Construction)	AR
12	881592-1	Latch - Door Weldment (Previous Construction)	AR
13	881590	Pivot - Latch	AR
14	880262	Spring - Door Catch	AR
15	356719-1	Arm - Pull (Current Construction)	AR
16	FP-35-91	Pipe 1/2 x 1 1/8 T.B.E.	AR
17	881467	Valve - Solenoid 1/2	AR
18	FP-47-9	Fitting - Tube 1/2 TBG x 1/2 MPT	AR
19	FP-59-3	Nipple - Pipe 1/2 x 5	AR
20	FP-84-39	Union 90 Deg.	AR
21	FP-54-39	Nipple - Pipe 1/2 x 2 1/2	AR
22	881426	Solenoid - Arm Lift	AR
23	RP-3-8	Roll Pin 3/16 Dia. x 1 1/8 Lg	AR
24	NS-3-29	Nut 5/16-18 "Elastic"	AR
25	NS-46-38	Nut - Lock 1/4-20 Hex	AR
26	881675	Valve - Gate	AR
27	FP-54-39	Nipple - Pipe 1/2 x 2 1/2	AR
28	NS-31-21	Stop Nut - Special 1/4-20 Hex	AR
29	WS-18-37	Washer	AR
30	SC-86-5	Shoulder Screw 3/8 D x 3/8 L Socket Hex Hd.	AR
31	881598-1	Header - Inlet (2 Compartment)	1
32	881598-2	Header - Inlet (3 Compartment)	1
33	FP-19-28	Tee 3/4 Bronze	1
34	FP-43-77	Nipple 3/4 x 4 Lg. (T.B.E.)	1
35	FP-15-23	Elbow 3/4 x 90 Deg. Brass	1
36	880026	Pressure Relief Valve (3/4)	1
37	881760	Breaker - Vacuum (Only On Units With Boilers)	1
38	FP-28-19	Plug - Pipe 3/4 (Only On Direct Steam Units)	1
39	FP-84-8	Plug - Pipe 1/2	AR
40	881594	Arm - Valve	AR
41	881429	Spring	AR
42	SC-53-2	Mach. Screw 10-24 x 1/2 Truss Hd. SST	AR
43	881414	Solenoid - Steam Control	AR
44	881898-1	Back - Control Housing (2 Compartment)	1
45	881898-2	Back Control Housing (3 Compartment)	1

PARTS LIST:
Level Control Box

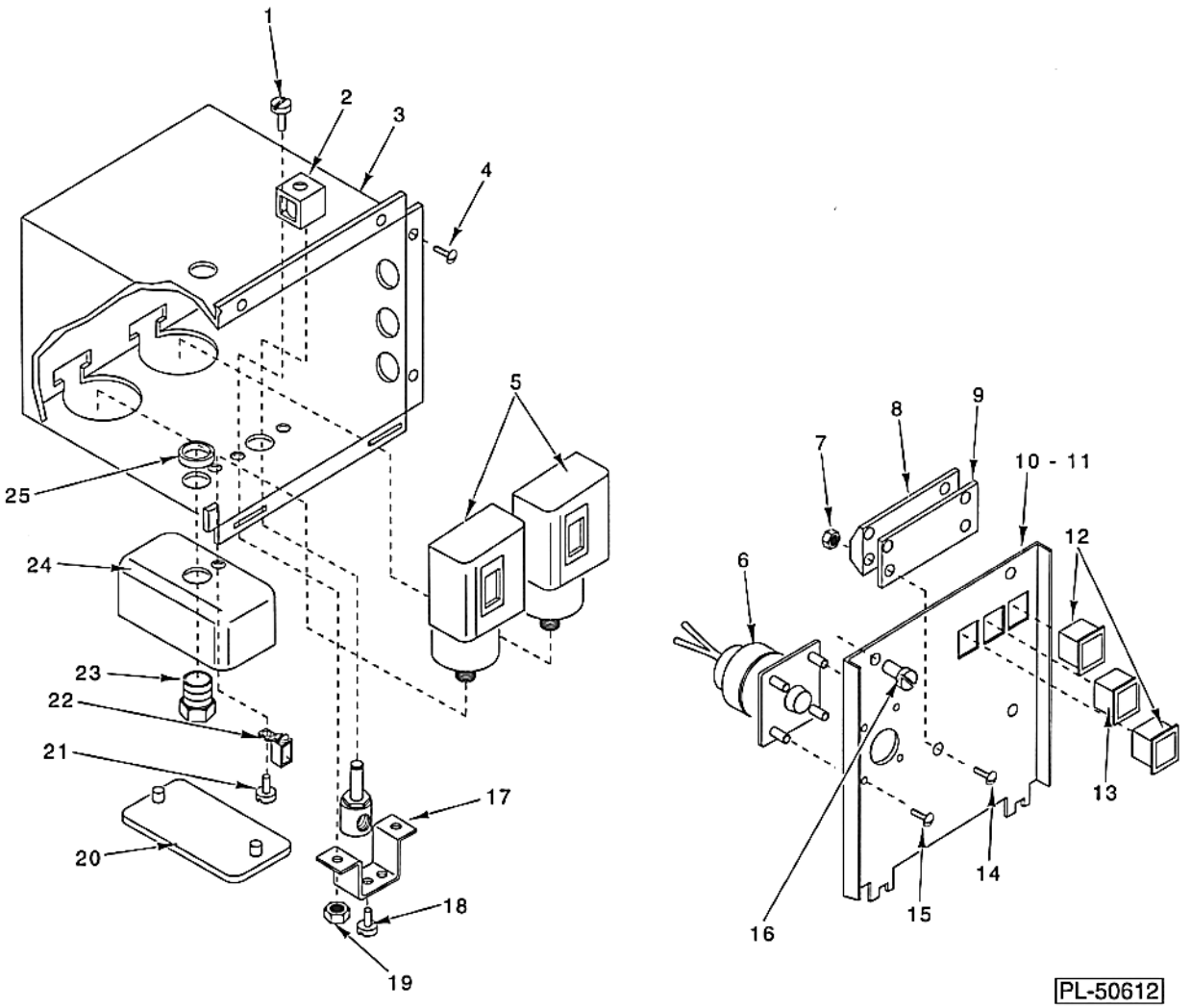


PARTS LIST:
Level Control Box

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50611	PART NO.	NAME OF PART	AMT.
1	880397	Connector 3/8" x 90 Deg. Sealtite	AR
2	880675	Connector 3/8" Straight Sealtite	AR
3	817256	Box - Level Control	1
4	SC-53-5	Mach. Screw 10-24 x 3/8 Truss Hd, Slotted	2
5	817257	Cover - Level Control Box	1
6	817234-1	Control - Differential Level	1
7	817234-1	Control - Low Level	1
8	SC-66-2	Mach. Screw 6-32 x 3/8 Phil. Truss Hd.	6
9	SC-53-41	Mach. Screw 1/4-20 x 1/2 Truss Hd. SST	1
10	SC-41-50	Cap Screw 1/4-20 x 1/2 Hex Hd.	2

PARTS LIST:
Generator Control Box — 36" Gas & Electric

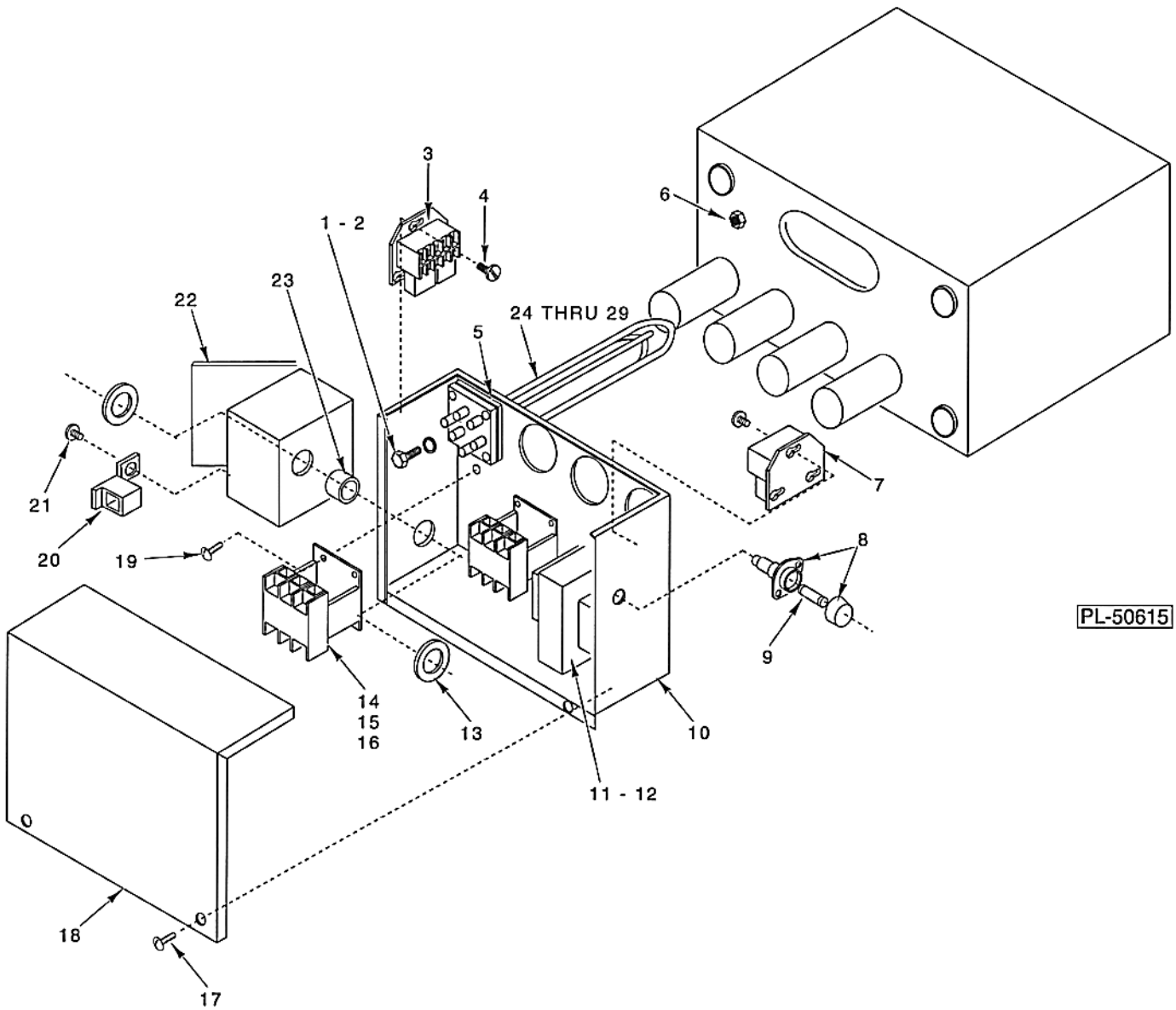


PARTS LIST:
Generator Control Box — 36" Gas & Electric

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50612	PART NO.	NAME OF PART	AMT.
1	SC-66-2	Mach. Screw 6-32 x 3/8 Phil. Truss Hd.	2
2	817222	Valve - Cold Water Condenser	1
3	881551-1	Box - Boiler Control	1
4	SC-53-2	Mach. Screw 10-24 x 1/2 Truss Hd. SST	4
5	833488	Switch - Pressure	2
6	817264	Timer	1
7	NS-11-18	Mach. Nut 10-24 Hex	2
8	881605	Strip - Terminal	1
9	881721	Strip - Terminal Marking	1
10	881552	Cover - Boiler Control Box (Manual Blow-Down)	1
11	817227	Cover - Boiler Control Box (Auto Blow-Down)	1
12	881579	Switch - Lighted (On/Off)	2
13	881673	Light - Indicator (Amber)	1
14	SC-119-53	Mach. Screw 8-32 X 3/4 Pan Hd.	2
15	SC-66-2	Mach. Screw 6-32 X 3/8 Phil. Truss Hd.	4
16	SC-53-2	Mach. Screw 10-24 x 1/2 Truss Hd. SST	1
17	817792	Bracket - Valve Retaining	2
18	RS-30-9	Rivet - Dome .125	2
19	NS-31-15	Stop Nut - Special 10-24 Hex (SST)	2
20	880396	Cover - Entrance Box (with screws)	1
21	SC-53-5	Mach. Screw 10-24 x 3/8 Truss Hd, Slotted	1
22	FE-23-87	Lug - Grounding	1
23	FP-54-8	Pipe 1/2 X 1.125 (T.B.E.)	1
24	880395	Box - Entrance	1
25	907998	Locknut 1/2" Conduit	AR

PARTS LIST:
Generator Contactor Box & Heater (Large Shell)

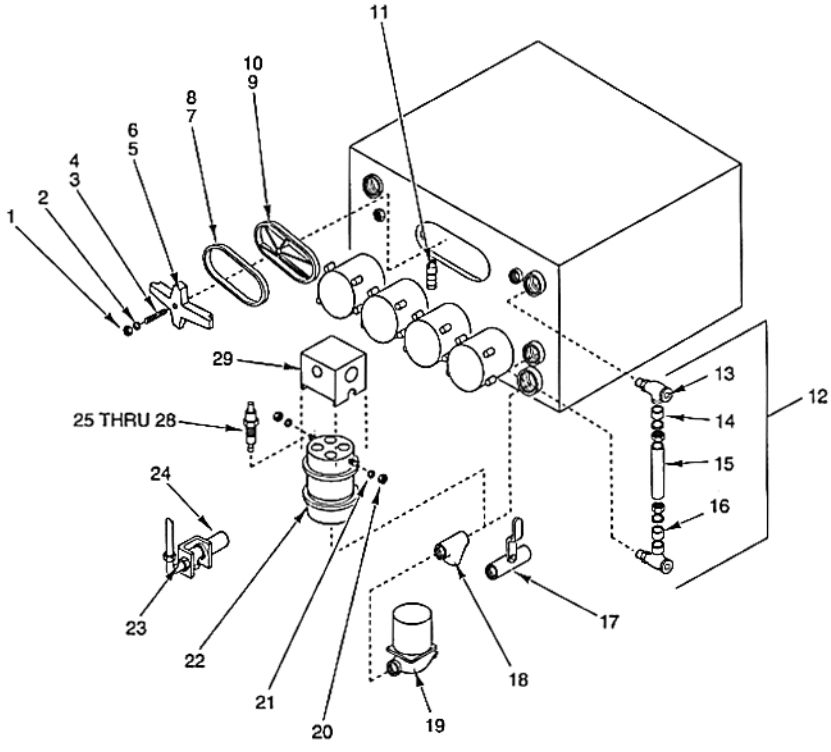


PARTS LIST:
Generator Contactor Box & Heater (Large Shell)

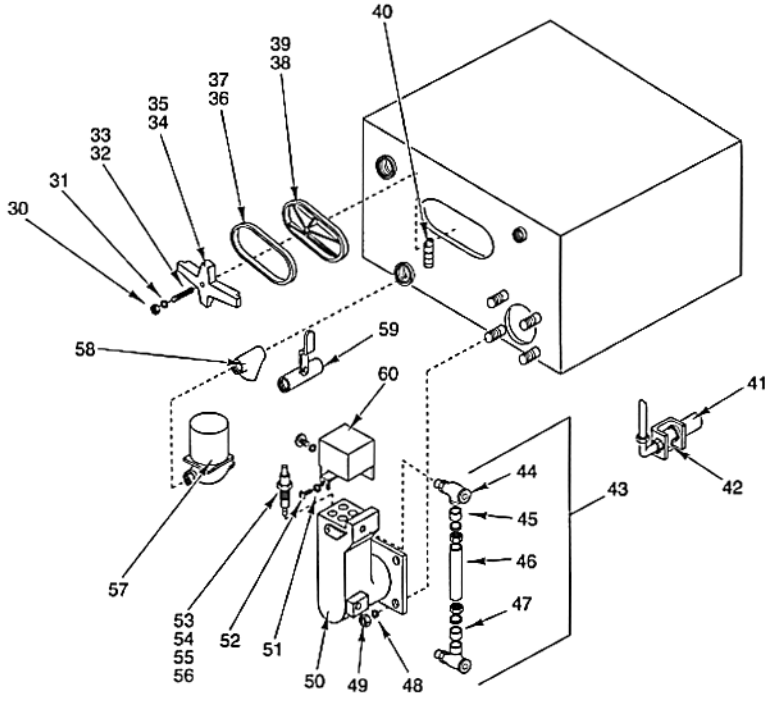
NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50615	PART NO.	NAME OF PART	AMT.
1	SC-41-19	Cap Screw 5/16-18 x 2 Hex Hd.	16
2	WL-7-19	Lockwasher 5/16 External Shakeproof	16
3	817234-1	Control - Differential Level	1
4	SC-66-2	Mach. Screw 6-32 x 3/8 Phil. Truss Hd.	6
5	880410	Gasket - Boiler Heater	8
6	NS-15-11	Full Nut 5/16-18 Hex	16
7	817234-1	Control - Low Level	1
8	881236	Fuseholder (W/Transformer Only)	1
9	881237	Fuse - 10 AMP (W/Transformer Only)	1
10	881528	Box - Contactor	1
11	880314	Transformer (Optional Extra)	1
12	SC-53-41	Mach. Screw 1/4-20 x 1/2 Truss Hd. SST	4
13	833514	Lock Nut 1 1/4 Conduit	2
14	881654	Contactor 40 AMP	1
15	881655	Contactor 50 AMP. (See Heat Circuits)	1
16	881656	Contactor 60 AMP.	2
17	SC-53-2	Mach. Screw 10-24 x 1/2 Truss Hd. SST	2
18	881529	Cover - Contactor Box	1
19	SC-53-2	Mach. Screw 10-24 x 1/2 Truss Hd. SST	1
20	FE-23-87	Lug - Grounding	1
21	SC-53-2	Mach. Screw 10-24 x 1/2 Truss Hd. SST	AR
22	833512	Box - Junction Entrance	1
23	FP-83-59	Nipple - 1 1/4 x 1.500 Conduit	1
24	832611-10	Heater Element (208 V. 6 K.W.)	AR
25	832611-11	Heater Element (240 V. 6 K.W.)	AR
26	832611-12	Heater Element (480 V. 6 K.W.)	AR
27	832611-13	Heater Element (208 V. 9 K.W.)	AR
28	832611-14	Heater Element (240 V. 9 K.W.)	AR
29	832611-15	Heater Element (480 V. 9 K.W.)	AR

PARTS LIST:
Generator



STEAM GENERATOR - LARGE & SMALL, REGENERATIVE & ELECTRIC



PL-50617

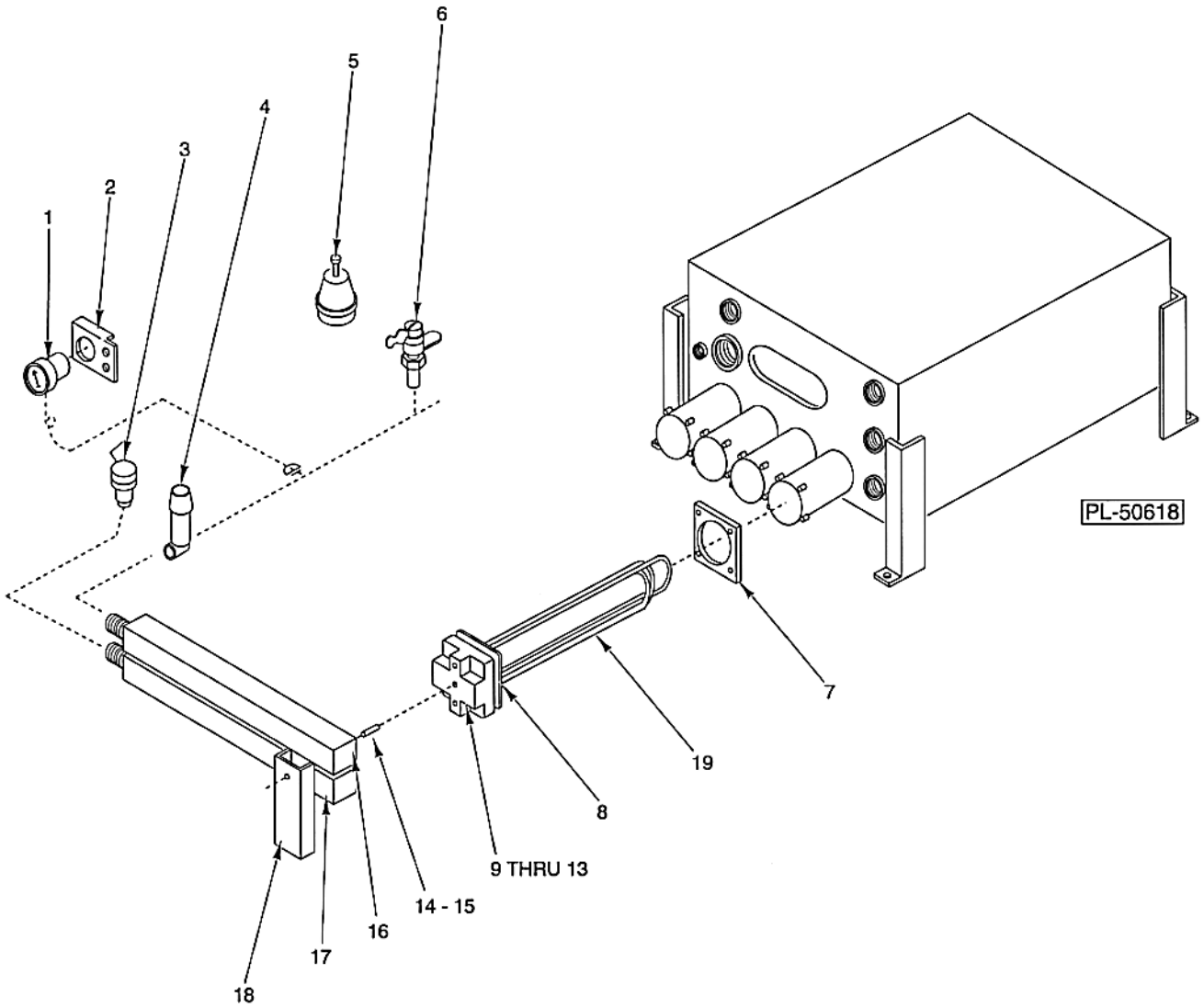
STEAM GENERATOR - LARGE & SMALL, GAS

PARTS LIST:
Generator

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50617	PART NO.	NAME OF PART	AMT.
1	NS-15-11	Full Nut 5/16-18 Hex	1
2	WS-5-32	Washer	1
3	880534	Stud - Hand Hole (Large)	1
4	817024	Stud - Hand Hole (Small)	1
5	880359	Spider - Hand Hole (Large)	1
6	817023	Spider Hand Hole (Small)	1
7	880023	Gasket - Hand Hole (Large)	1
8	817025	Gasket - Hand Hole (Small)	1
9	880358	Plate - Hand Hole (Large)	1
10	817022	Plate - Hand Hole (Small)	1
11	880044	Descaler	1
12	817098	Glass - Gage	1
13	817098-3	Fitting - Gage Glass Top	1
14	817098-5	Washer - Gage Glass Sealing	1
15	817098-14	Tube - Gage Glass Sealing	1
16	817098-5	Washer - Gage Glass Sealing	1
17	881162	Valve - Drain/Blowdown (With Handle)	1
18	909459	Strainer (Auto Blowdown Only)	1
19	881865	Valve - Steam Inlet Solenoid	1
20	NS-11-18	Mach. Nut 10-24 Hex	2
21	WS-19-6	Washer	2
22	817506	Canister Assy. (Incls.items 20, 21 & 25 thru 29)	1
23	880469	Strainer	1
24	881161	Valve - Water Inlet	1
25	817233	Probe - Water Level Control	AR
26	817477-4	1 1/4" Extension Water Level Probe	1
27	817477-5	2" Extension Water Level Probe	1
28	817477-2	2 1/2" Extension (Calif. Only)	1
29	817504	Cover - Canister Top	1
30	NS-15-11	Full Nut 5/16-18 Hex	1
31	WS-5-32	Washer	1
32	880534	Stud - Hand Hole (Large)	1
33	817024	Stud - Hand Hole (Small)	1
34	880359	Spider - Hand Hole (Large)	1
35	817023	Spider Hand Hole (Small)	1
36	880023	Gasket - Hand Hole (Large)	1
37	817025	Gasket - Hand Hole (Small)	1
38	880358	Plate - Hand Hole (Large)	1
39	817022	Plate - Hand Hole (Small)	1
40	880044	Descaler	2
41	881161	Valve - Water Inlet	1
42	880469	Strainer	1
43	817098	Glass - Gage	1
44	817098-3	Fitting - Gage Glass Top	1
45	817098-5	Washer - Gage Glass Sealing	1
46	817098-14	Tube - Gage Glass Sealing	1
47	817098-5	Washer - Gage Glass Sealing	1
48	WL-4-27	lockwasher 3/4 Helical	4
49	NS-17-45	Jam Nut 3/4-10 Hex	4
50	817580-1	Housing - Integral Probe	1
51	WS-19-6	Washer	2
52	SC-53-5	Mach. Screw 10-24 x 3/8 Truss Hd, Slotted	2
53	817233	Probe - Water Level Control	4
54	817477-4	1 1/4" Extension Water Level Probe	1
55	817477-5	2" Extension Water Level Probe	1
56	817477-2	2 1/2" Extension (Calif. Only)	1
57	881865	Valve - Solenoid (Auto Blowndown)	1
58	909459	Strainer (Auto Blowdown Only)	1
59	881162	Valve - Drain/Blowdown (With Handle)	1
60	817600	Cover - Water Level Probe	1

PARTS LIST:
Regenerating Steam Boiler

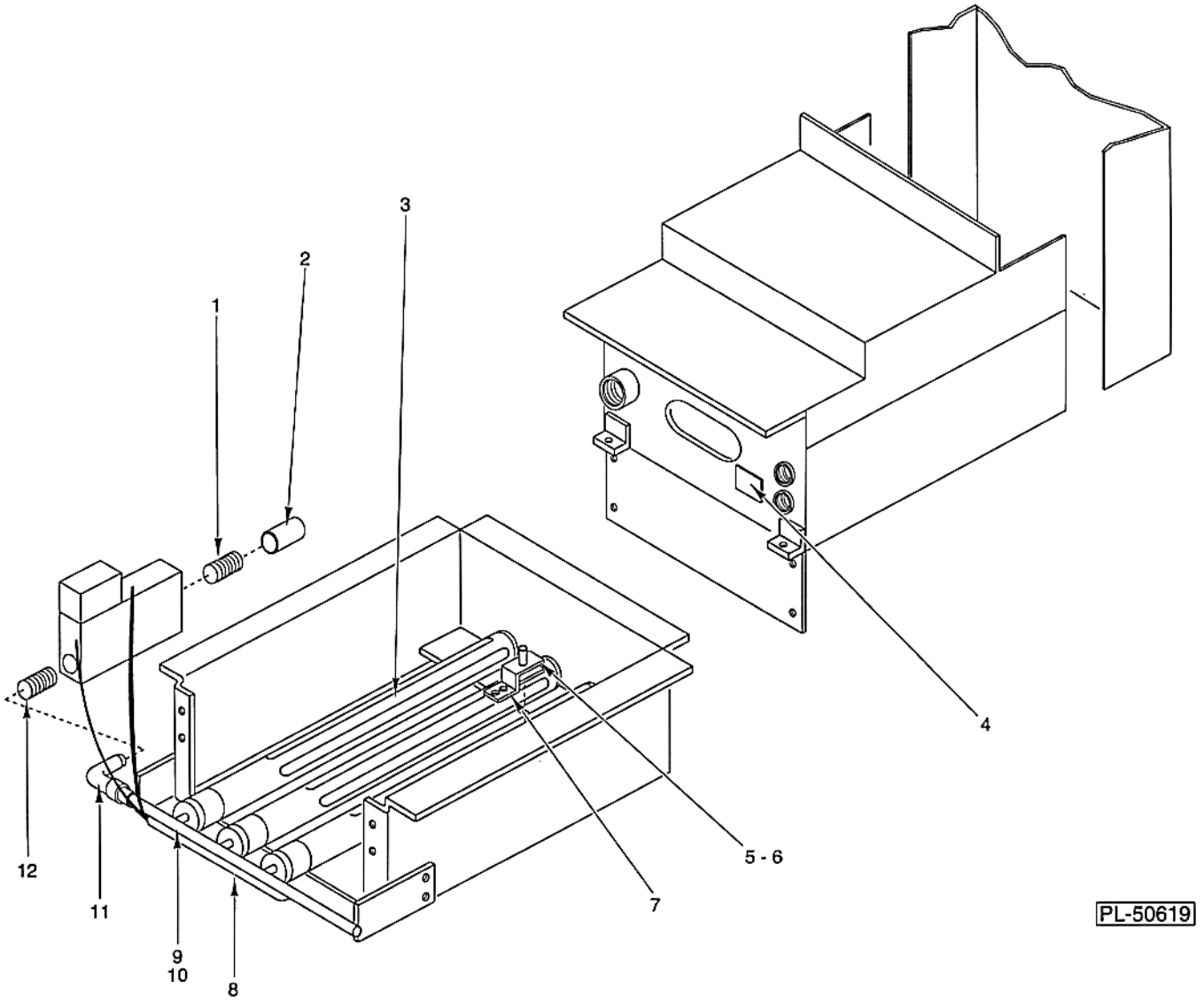


PARTS LIST:
Regenerating Steam Boiler

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50618	PART NO.	NAME OF PART	AMT.
1	833152	Gauge - Pressure 0-31 P.S.I. 1/4 MPT	1
2	881057	Bracket - Pressure Gauge	1
3	881342	Trap - Steam	1
4	881865	Valve - Steam Inlet Solenoid	1
5	880028	Valve - Pressure Regulating 3/4 N.P.T.	1
6	880413	Valve - Pressure Relief 3/4 N.P.T.,15 P.S.I.	1
7	880410	Gasket - Boiler Heater	8
8	881047	Gasket - Heater Cover	4
9	881043	Cover - Heater Plate	4
10	SC-119-34	Cap Screw 5/16-18 x 3 1/4 Hex Hd.	16
11	WS-5-43	Washer	16
12	881046	Stud - Heater Cover	4
13	NS-15-11	Full Nut 5/16-18 Hex	16
14	881049	Tube - Manifold Gasket	8
15	881048	Gasket - Manifold	8
16	881050-1	Inlet Manifold Assy.	1
17	881164-1	Exhaust Manifold Assy.	1
18	881054	Clamp - Manifold	4
19	881044-1	Steam Heater Assy.	4

PARTS LIST:
Generator Combustion Chamber

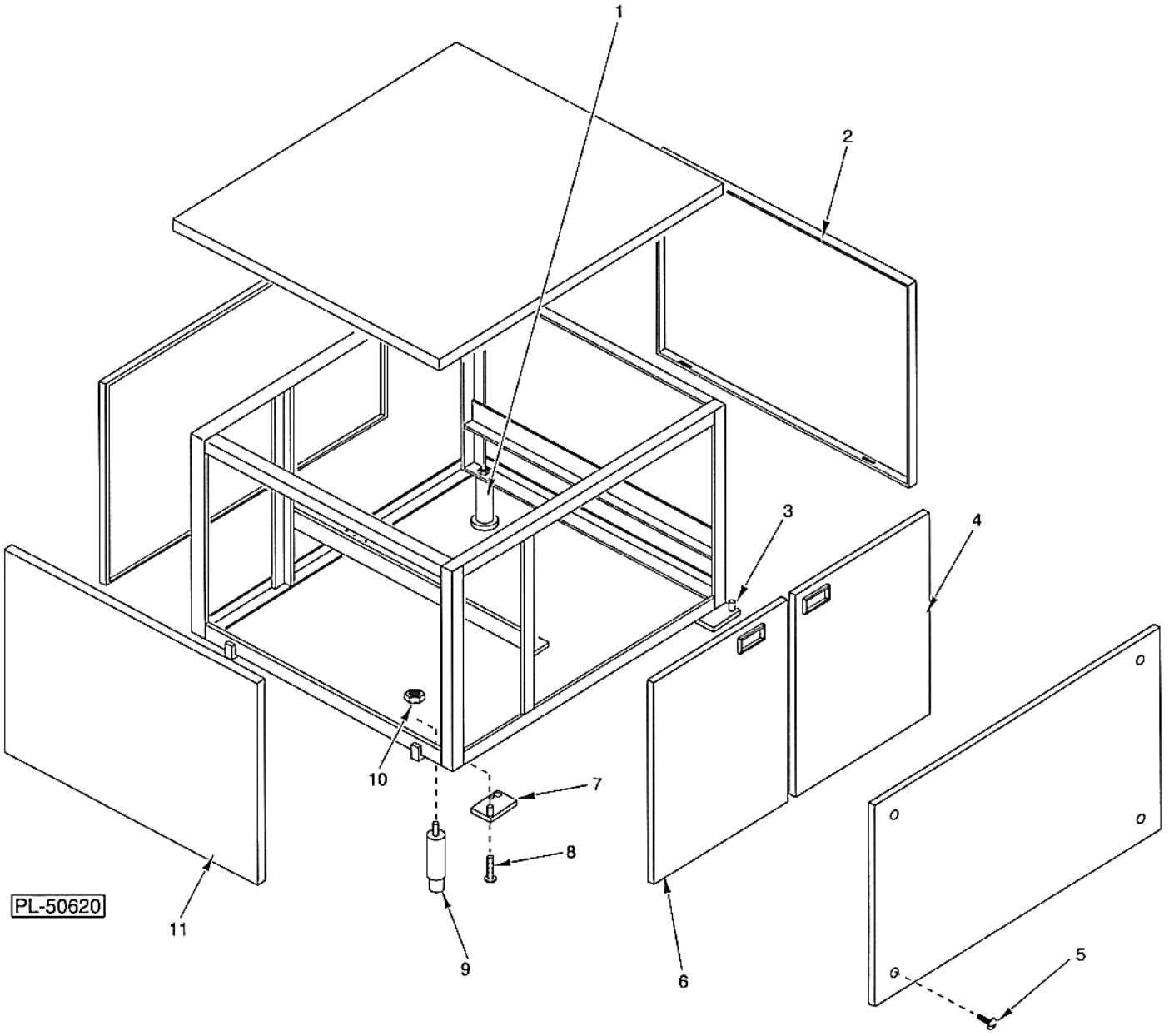


PARTS LIST:
Generator Combustion Chamber

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50619	PART NO.	NAME OF PART	AMT.
1	FP-54-27	Nipple 3/4 x 1 3/8 TBE (SST)	1
2	FP-23-24	Coupling - 3/4 N.P.T. Pipe	1
3	817200	Sheet Metal Burner & Air Shutter Assy.	AR
4	880012	Plate - Lighting Instruction	1
5	817508	Thermocouple	1
6	817363-1	Pilot Body - Standard Ignition System	1
7	817916-1	Bracket - Mounting	1
8	500235	Tube - Pilot (28" Aluminum)	1
9	817167	Manifold - Gas (7 Burners)	1
10	817166	Manifold - Gas (5 Burners)	1
11	FP-88-44	Elbow - 3/4 N.P.T. x 90 Deg. Union	1
12	FP-54-27	Nipple 3/4 x 1 3/8 TBE (SST)	1

PARTS LIST:
Generator Frame



PARTS LIST:
Generator Frame

NOTE: When ordering parts, always give the model and serial number of the equipment.

ILLUS. PL-50620	PART NO.	NAME OF PART	AMT.
1	881526	Leg - W/6" Adjustable Flange Foot	2
2	881536	Panel - Side	1
3	881540-1	Hinge - Bottom Right	1
4	841985	Base Door Assy. (Right)	1
5	SC-53-3	Mach. Screw 10-24 x 3/4 Truss Hd., Slotted	4
6	842161	Base Door Assy. (Left)	1
7	881541-1	Hinge - Bottom Left	1
8	SC-41-50	Cap Screw 1/4-20 x 1/2 Hex Hd.	4
9	881525	Leg - W/6" Adjustable Foot	2
10	NS-15-17	Mach. Nut 5/8-11 Hex	4
11	881536	Panel - Side	1
	805961-11	Caster W/Out Brake	2
	805961-12	Caster W/Brake	2

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